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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING NOVEMBER 30, 1936

PUBLICATION OF THIS DOCUMENT APPROVED BY THE COMMISSION ON ADMINISTRATION AND FINANCE

800. 5-'37. No. 685

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1936, its

ELEVENTH ANNUAL REPORT

I. Organization and Administration

Eugene C. Hultman continued during the year as Chairman of the Commission and Thomas D. Lavelle as Associate Commissioner, the latter being reappointed. Charles M. Davenport continued as Associate Commissioner until August 12, when he was succeeded by Edward J. Kelley of Worcester. R. Nelson Molt continued as Secretary. Three special agents under the direction of the Commission continued to care for the property acquired by the Commission in the Swift River and Ware River areas.

Real Estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 157 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 706 persons. In addition, a maximum of 102 persons was employed on force account by the Commission for forestry work, the removal of bodies and miscellaneous work of maintenance.

Under the instruction of the Governor and Council, as an unemployment relief measure, the Commission, starting in April, employed men on a project to clear the trees and brush areas below the future reservoir flow line which have been acquired by the Commonwealth and upon which there is no valuable standing timber. An average weekly force of about 2,600 men was employed by the Commission continuously on this work commencing about May 1, 1936, the maximum being about 3,200 in June. Suitable hardwoods were cut and stacked for future disposal as cordwood, and other materials from the clearing operations were piled for burning. This project was undertaken at this time as an unemployment relief measure.

It was necessary to substantially increase the clerical force of the Commission's office in Boston to take care of the additional work in connection with the Quabbin Reservoir clearing project.

The Commission continued, through duly appointed agents, the direction of the town government of the Town of Prescott, as provided by Chapter 340 of the Acts of 1928. A financial statement for the town is included in the Commission's report to the Commissioner of Corporations and Taxations.

During the year, disposition by trial was made by the Attorney General as Counsel for the Commission of pending petitions in the Superior Courts brought by five owners of water privileges on the Ware River for damages claimed by diversion of the waters of the Ware River, and of one owner of a water privilege on Beaver Brook for damages claimed by the diversion of the waters of Beaver Brook.

II. Engineering Department

Frank E. Winsor continued as Chief Engineer, Karl R. Kennison as Assistant Chief Engineer, and Walton H. Sears as Mechanical Engineer.

The field divisions continued as follows: Quabbin Reservoir Division at Enfield, in charge of N. LeRoy Hammond until October 31; Quabbin Aqueduct Division at Coldbrook in charge of William W. Peabody until October 31, and thereafter a consolidation of both divisions into the Quabbin Reservoir and Aqueduct Division in charge of William W. Peabody.

Charles T. Main, Inc., of Boston, was employed from time to time as a general consultant on mill and water power damages and also on the design of the dam and dike of Quabbin Reservoir. Dr. Charles P. Berkey of Columbia University continued as consulting geologist. Other consultants were employed from time to time as needed.

III. Offices

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission Building at 20 Somerset Street, Boston. A branch office in Enfield was established on April 27 for the Quabbin Reservoir clearing project. Offices at various places on the work were occupied from time to time as required and the laboratories for water analysis and soil testing were continued at Enfield.

IV. Real Estate and Water Rights

The Commission for reservoir purposes and sanitary protection, has acquired a total of approximately 67,415 acres of land in the Swift River watershed, and for sanitary protection and construction purposes in the Ware River watershed a total of about 10,575 acres.

The Commission's petition for a new board of referees to rehear the petition of Maher and Duggan, owners of land in Greenwich, is still pending in the Supreme Judicial Court.

V. Ware River Supply

The Rutland-Holden sewer was operated throughout the year to divert from the Ware and Wachusett watersheds the sewage of the U. S. Veterans Hospital and the State Sanatorium in Rutland.

The temporary chlorinating plant in the upper watershed of the Ware River was operated from time to time as required.

Water was diverted from the Ware River from time to time between December 1, 1935, and March 18, inclusive.

VI. Swift River Supply

Real estate and topographic surveys were continued during the year. Reforestation of areas above the flow line of Quabbin Reservoir was continued and nurseries established and maintained.

The Two Companies, Inc., practically completed the work under Contract 38, for the construction of a core wall to sound rock at the site of the main dam of Quabbin Reservoir, thus preparing the foundations for the construction of the main dam embankment and spillway.

The policy of publicly advertising for bids on all construction work was continued and Contract 47 was awarded on April 21 to Vincent Caira, Newtonville, the lowest bidder, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich. Work has been in progress under this contract.

Cenedella & Company practically completed the work under Contract 49, for excavating diversion channels at Shafts 11A and 12 of Quabbin Aqueduct and between the East and Middle branches of the Swift River.

The Arthur A. Johnson Corporation continued the work under Contract 50, for constructing the embankment of the dike of Quabbin Reservoir. The central portion of the embankment has been carried to an elevation five feet above the future flow line and the work of hydraulic sluicing was completed on September 20.

Contract 51 was awarded on May 28 to Franklin A. Snow Company, Boston, Mass., the lowest bidder, for constructing the East Branch Baffle at the site of Quabbin Reservoir in the towns of Greenwich and Hardwick. The central portion of the embankment has been extended approximately to the elevation of the flow line of Quabbin Reservoir, except for a gap at the westerly end through which the existing highway, route 21, will continue past it at an elevation about 35 feet below the future flow line.

Contract 52 was awarded on July 16 to Benjamin Foster Company, Philadelphia, Pa., the lowest bidder, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield, and Ware. The contractor has completed the foundation grading and has assembled a portion of his hydraulic sluicing plant in readiness for the commencement of sluicing next spring.

Contract 53 was awarded on April 30 to The English Construction Company, Lowell, Mass., the lowest bidder, for constructing the head house at Shaft 9 of Quabbin Aqueduct in the Town of Barre. The work was practically completed at the end of the year.

Contract 54 was awarded on May 7 to Carlo Bianchi & Company, Inc., Framingham, Mass., the lowest bidder, for constructing and improving a section, in the towns of Dana and Petersham, of the highway along the east side of the future Quabbin Reservoir. The work was practically completed on November 17.

Contracts were awarded for a State highway 8.0 miles long extending across the northerly end of the future Quabbin Reservoir from Petersham to a connection with the Daniel Shays Highway, New Salem, Route 202. Contract 55 was awarded on June 7 to Arute Bros., Incorporated, Bridgewater, Mass., the lowest bidder, for constructing the easterly portion of this highway in Worcester County. Contract 57 was awarded on July 2 to John Iafolla Construction Company, Dedham, Mass., the lowest bidder, for constructing the westerly portion in Franklin County. The work under Contract 55 was practically completed, except for guard rail, at the end of the year and that under Contract 57 was in progress.

VII. General

The engineering force continued its studies of the development of hydroelectric power at various points on the work. No electric power development is practicable until the completion of Quabbin Reservoir provides the necessary storage of water.

Work continued on the general reforestation of areas purchased by the Commission above the flow line of Quabbin Reservoir. The Commission's nursery in the Town of Greenwich was enlarged and seed beds planted to produce over five million seedlings of mixed varieties. A permanent nursery in Belchertown above the flow line of Quabbin Reservoir was established.

During the unprecedented floods of March, many of the old bridges and highways in the area to be affected by Quabbin Reservoir were damaged, and in some instances it was deemed advisable by the municipal authorities to abandon the roads at this time to avoid the necessity of extensive repairs.

The engineering force of the Commission was continuously on duty during this period, and its aid and assistance were offered and accepted not only by the authorities of the communities within the Quabbin Reservoir and Ware River areas, but in the flood areas in the Miller and Connecticut River Valleys.

VIII. Special Investigations

As required by Chapter 18 of the Resolves of the Legislature for the year 1936, an investigation was carried on by the Commission together with the Metropolitan District Commission and the Department of Public Health, acting as a joint board, relative to the possible setting off of a portion of Lake Cochituate for boating and fishing. A report in accordance with the provisions of said resolve was prepared and filed in the manner and at the time prescribed.

As required by Chapter 48 of the Resolves of the Legislature for the year 1936, an investigation was carried on by the Commission and the Department of Public Health, acting as a joint board, relative to improvements in the distribution system and allied matters, particularly the possible construction of a pressure distribution tunnel from the Wachusett source of supply to the Metropolitan District. This investigation is required to be completed in 1937.

IX. Cemeteries

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 561 bodies were removed from the Quabbin Reservoir area during the year, of which 541 were interred in Quabbin Park Cemetery. To date a total of 3,026 bodies have been removed from the Quabbin Reservoir area; of which 2,181 were interred in Quabbin Park Cemetery, and there have been 89 original burials in Quabbin Park Cemetery.

X. Financial

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

XI. Other Reports

The report of the Chief Engineer is herewith presented.

Respectfully submitted,
E. C. HULTMAN, *Chairman.*
THOMAS D. LAVELLE, *Associate Commissioner.*
EDWARD J. KELLEY, *Associate Commissioner.*

20 Somerset Street, Boston, Mass.
January 2, 1937.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

Gentlemen:—The following is a report of the engineering department for the year ending November 30, 1936.

Organization

It has been necessary to increase the engineering organization about 25 per cent during the year to handle the work of additional construction contracts and the Quabbin Reservoir clearing project.

Karl R. Kennison, Assistant Chief Engineer, continued in charge of all studies in connection with the general plan of the work and the design of structures, preparation of contract specifications, contract and working drawings.

Charles L. Coburn and Stanley M. Dore, Associate Civil Engineers, continued their general supervision of the detailed work of the office, and Walton H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages. They have assisted in the preparation of contract specifications.

The work in the field continued in charge of Division Engineer N. LeRoy Hammond, Quabbin Reservoir Division, and William W. Peabody, Quabbin Aqueduct Division, until November 1, when Mr. Hammond resigned to accept a more attractive position elsewhere. Owing to the completion of many important structures, the work was then consolidated into the Quabbin Reservoir and Aqueduct Division, in charge of Mr. Peabody.

Charles T. Main, consulting engineer of Boston, Dr. Charles P. Berkey, geologist of Columbia University, and other experts were employed from time to time.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1935	Nov. 30, 1936
Headquarters Office, Designing Division	39	44
Main Dam Core Wall Office	27	—
Coldbrook Office, Quabbin Aqueduct Division	14	—
Quabbin Reservoir and Aqueduct Division	—	34
Enfield Office, Quabbin Reservoir Division	57	—
Quabbin Reservoir and Aqueduct Division	—	93
Total Engineering Force	137	171

The maximum force during the year was 183, during the three weeks ending August 8. The minimum force was 135, during the two weeks ending January 4 and the four weeks ending April 25. The average force for the year was 157.

Offices

The office of the Chief Engineer and Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. The offices in the Ware River intake building in Coldbrook and in the property of the Commonwealth formerly known as the Frances W. Chandler house on Quabbin Road in Enfield, were continued throughout the year, being respectively the headquarters of the Quabbin Aqueduct Division and of the Quabbin Reservoir Division. The Quabbin Reservoir and Aqueduct Division has its headquarters in the Chandler house. Branch offices were maintained at other locations where work under important contracts was in progress. The laboratories for water analysis and for soil testing were continued in the property of the Commonwealth formerly known as the Barlow house, in Enfield. To handle the Quabbin Reservoir clearing project, a branch office was established on April 27, in the property of the Commonwealth, formerly known as the Nellie Brown house on Main Street in Enfield.

Headquarters Office

Summary of the Year's Work

Real Estate. — Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 2,489 acres, making a total reported on to date of 81,688 acres.

Progress of Real Estate Purchases for Quabbin Reservoir

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1936	3,911
Total to Nov. 30, 1935	63,504
Total to Nov. 30, 1936	67,415

Options outstanding Nov. 30, 1936, include 1,439 acres.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 2,935 acres, making a total reported on to date of 16,948 acres.

Progress of Real Estate Purchases for Ware River Watershed Protection

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1936	4,380
Total to Nov. 30, 1935	6,195
Total to Nov. 30, 1936	10,575

Options outstanding Nov. 30, 1936, include 1,922 acres.

Real estate taking plans were prepared and filed during the year as shown in the appended table.

Water Diversion Damage Claims. — Data were prepared for the use of the attorneys in water diversion cases before the courts.

Contracts and Specifications. — Contract 47, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich, was executed May 4.

Plans and specifications were prepared for Contract 51, for constructing the East Branch Baffle at the site of Quabbin Reservoir in the towns of Greenwich and Hardwick, and the contract was executed June 23.

Plans and specifications were prepared for Contract 52, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware, and the contract was executed August 24.

Contract 53, for constructing the head house at Shaft 9 of Quabbin Aqueduct in the Town of Barre, was executed May 7.

Plans and specifications were prepared for Contract 54, for construction of a highway in the towns of Dana and Petersham, Worcester County, and the contract was executed May 22.

Plans and specifications were prepared for Contract 55, for construction of a portion of the Petersham-New Salem highway in the County of Worcester, and the contract was executed June 23.

Plans and specifications were prepared for Contract 57, for construction of a portion of the Petersham-New Salem highway in the County of Franklin, and the contract was executed September 1.

Working drawings for Contracts 38, 47, 50, 51, 52, and 53 were prepared and issued.

Work was in progress on the preparation of plans and specifications for constructing a group of administration buildings near the site of the main dam of Quabbin Reservoir in the Town of Belchertown.

Inspection and Tests. — The Haller Testing Laboratories, Inc., of Plainfield, N. J., continued the testing of cement until February 1, after which time the testing was done by E. L. Conwell and Company of Philadelphia, Pa. The Worcester Polytechnic Laboratory continued the testing of steel reinforcement bars and concrete cylinders furnished under Contract 53, and also tested highway cable guard rail posts, and structural steel and roof slabs for buildings constructed under Contracts 47 and 53. Structural steel furnished under Contract 53 was tested and inspected by William R. Conard of Burlington, N. J. The inspection of structural steel furnished under Contract 47, and all miscellaneous building materials furnished under Contracts 47 and 53 was made by the engineering force. Shearing and other tests of materials deposited in the embankment of the dike of Quabbin Reservoir under Contract 50 were made at the soil testing laboratory of Harvard University under an agreement with this university for the study and publication of data on the stability of hydraulically-placed earth embankments.

Hydrographic Data. — The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was continued in cooperation with that company and the U. S. Geological Survey.

This Commission cooperated with the U. S. Geological Survey in the construction of a gaging station on the Swift River near the outlet of Pottapaug Pond in Hardwick, to continue records formerly kept by the Department of Public Health.

The gaging station on the Swift River above the intake to the stream control tunnel at the main dam was continued.

Cooperation with the United States Geological Survey in the operation and maintenance of the gaging station on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations, in order to obtain data for the use of consultants and experts engaged by the Attorney-General in the defense of claims against the Commonwealth for damages due to diversion of water from these rivers.

Unprecedented Floods

From March 12 to 24, inclusive, floods occurred on both the Ware and Swift river watersheds that far exceeded any that have occurred since continuous records were begun in 1913, or in fact within the memory of the oldest residents. On the Ware River at the intake works the first peak occurred at 7.00 P.M., March 13, being at the rate of about 1,515 million gallons per day, or 24.2 cubic feet per second per square mile of watershed area. The second and principal peak occurred at 11.00 A.M., March 19, being at the rate of about 3,870 million gallons a day, or 61.9 cubic feet per second per square mile of watershed area. This was nearly four and one-half times the previously recorded maximum. The depth of flow over the diversion dam was 4.35 feet. The intensity of the first flood peak, until March 14, was substantially reduced, probably about 20 per cent, at Ware due to the diversion of about 2,074 million gallons into Wachusett Reservoir in the four days, March 11 to 14, inclusive.

On the Swift River at the main dam the first peak occurred at 10.00 P.M., March 13, being at the rate of about 1,990 million gallons per day, or 16.6 cubic feet per second per square mile of watershed area. The second and principal peak occurred at 6.00 P.M., March 19, being at the rate of about 4,910 million gallons per day, or 40.8 cubic feet per second per square mile of watershed area. This was over three and one-half times the previously recorded maximum. The entire flow was carried past the site through the stream control tunnel. The water nearly filled the tunnel, being within about one foot of the top of the arch at the downstream end. The Ware-Belchertown road just below the dam site was barely overtopped at a low point east of the Swift River bridge, this low point having been provided for the purpose of safeguarding the bridge itself in the case of extreme floods, such as this one, that might occur before the completion of the construction of the main dam. The Ware-Belchertown road was not damaged and traffic was not interrupted.

A hydrograph of the flood on the Ware River at Coldbrook and on the Swift River at the main dam is shown herein.

Computations of the effect of such a flood occurring on the Swift River, after the Quabbin Reservoir has been completed and filled to the level of the spillway, show that the water level in the reservoir would be raised less than 1¾ feet above the flow line. The maximum rate of discharge over the spillway would be only about 39 per cent of the observed peak above noted, due to the effect of storing the flood waters in the large area of the reservoir and thus distributing the discharge over a longer period of time. The effect of the large reservoir area in reducing the rate of spillway discharge would be much greater in a flood of ordinary characteristics, that is with a single peak, than in the case of the 1936 flood, which consisted of a preliminary peak carrying enough water to raise the reservoir about eight-tenths foot above the flow line, followed only six days later by a second peak of more than twice the intensity of the first.

No damage of any consequence was done to any of the new construction. On the Daniel Shays Highway the West Branch of the Swift River overtopped the road and caused a small washout on the downstream side. Traffic was not interrupted and repairs were made promptly by the Department of Public Works. On the Rutland-Holden sewer the embankment was overtopped at one small culvert but no damage was done to the sewer pipe.

The steel bulkhead in the tunnel, about 2,200 feet west of the Ware River intake works at Shaft 8, was subjected for many hours to extreme pressure due to the maximum diversion into Wachusett Reservoir. It suffered no damage and prevented any flow westerly into the Swift River. This bulkhead will be removed upon the completion of Quabbin Reservoir.

Ware River Diversion

Ware River water was diverted into Wachusett Reservoir December 1 and 2, 1935, January 4 to 9, inclusive, 11, 12 and 14 to 24 inclusive, March 11 to 14, inclusive, and 18. No water was diverted between May 31 and December 1. At other times, although the daily flow in the river was sufficient to permit diversion, no diversion except as above stated was made because of the present inadequacy of storage capacity in the reservoirs of the District. The first flood peak, March 12 to 14, inclusive, was diverted in large part into the Wachusett Reservoir and on March 13 the tunnel delivered into Wachusett Reservoir its maximum carrying capacity in that direction of about 1,250 million gallons a day.

The entire flow of the Ware River at Coldbrook from March 12 to 24 inclusive, was about 17,300 million gallons, of which about 12,800 million gallons could have been diverted into Quabbin Reservoir if it had been completed and ready to receive the water, in addition to the 2,000 million gallons actually diverted into Wachusett Reservoir. During this same flood period the total quantity passing the main dam on the Swift River was about 26,000 million gallons. If such a period of stream flow should reoccur when the Quabbin Reservoir is ready to be filled, the depth of water at the main dam would be raised 70 feet to about elevation 452, and at the lower intake to Quabbin Aqueduct, 25 feet over the sill. The quantity of water diverted during the year was 3,120,200,000 gallons.

Sewage Diversion from Ware River Watershed

The Rutland-Holden sewer continued in operation. During the fiscal year of the City of Worcester which includes the 12 months ending December 31, 1936, 46,660,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 22,318,000 gallons came from the U. S. Veterans Hospital.

Investigation of Lake Cochituate

Chapter 18 of the Resolves of 1936, approved May 22, provides:

> "That the metropolitan district commission, the metropolitan district water supply commission and the department of public health, acting as a joint board, are hereby authorized and directed to investigate methods of setting off from Lake Cochituate in the town of Natick a portion thereof for use for boating and fishing, in such manner as to prevent any of the waters of the portion so set off from entering the remaining portions reserved as an emergency water supply for the metropolitan water district, by the construction of dams, dikes, spillways, channels or other works, and to investigate relative to the cost of the same, including the amount of damage to property, and relative to other matters pertaining to the project, including all questions relating thereto. Said joint board may make such surveys and borings and do such other preliminary work on public or private lands as it may deem necessary or desirable, doing as little damage as possible; and any person whose property is injured thereby may recover therefor from the commonwealth under chapter seventy-nine of the General Laws. For the purpose of carrying out the provisions of this resolve, said joint board shall proceed with the respective organizations of said commissions and said department in the manner provided by chapter three hundred and seventy-five of the acts of nineteen hundred and twenty-six, chapter three hundred and twenty-one of the acts of nineteen hundred and twenty-seven, and chapter one hundred and eleven of the General Laws. The funds provided for metropolitan water supply purposes by said chapter three hundred and seventy-five and said chapter three hundred and twenty-one, and acts in

> amendment thereof and in addition thereto, are hereby made available for carrying out the purposes of this resolve. Said joint board shall report to the general court the results of its investigation and its recommendations relative thereto, together with plans and estimates of the cost of any changes in existing works and of any new works that it may deem necessary or desirable, and drafts of legislation necessary to carry its recommendations into effect, by filing the same with the clerk of the house of representatives on or before the first Wednesday in December in the year nineteen hundred and thirty-six."

The investigation was made as required by members of the engineering force acting in cooperation with engineers of the Metropolitan District Commission and Department of Public Health. The report, dated December 2, 1936, was completed, signed individually by members of the joint board and filed as required by the resolve.

Investigation of Distribution System

Chapter 48 of the Resolves of 1936, approved June 16, provides:

> "That the metropolitan district water supply commission and the department of public health, acting jointly, are hereby authorized and directed to investigate methods of improving the distribution of water from the sources of supply to the metropolitan water district, more adequately preventing pollution of the sources of water supply of such district by the construction of pressure tunnels, aqueducts or other works, and by the elimination of sources of pollution, and of protecting the purity of the water, and to investigate as to the cost of such improvements and works, the damage to property and other matters pertaining to the subject, including all questions relating thereto. Said joint board may make such surveys and borings and do such other preliminary work on public or private lands as it may deem necessary or desirable, doing as little damage as possible and paying for the same. For the purpose of carrying out the provisions of this resolve, said joint board shall proceed with the respective organizations of said commission and said department and in the manner provided by chapter three hundred and seventy-five of the acts of nineteen hundred and twenty-six, chapter three hundred and twenty-one of the acts of nineteen hundred and twenty-seven, and chapter one hundred and eleven of the General Laws. The funds provided for metropolitan water supply purposes by said chapter three hundred and seventy-five and said chapter three hundred and twenty-one, and any additions thereto or amendments thereof, are hereby made available for carrying out the purposes of this resolve. Said joint board shall report to the general court the results of its investigation and recommendations relative thereto, together with plans and estimates of the cost of any changes in existing works and of any new works that it may deem necessary or desirable, and drafts of legislation necessary to carry its recommendations into effect, by filing the same with the clerk of the house of representatives on or before the first Wednesday in December in the year nineteen hundred and thirty-seven."

Work has been in progress in accordance with the requirements of this resolve.

Design of Structures

Shaft 1. Wachusett Outlet. — Studies were continued of the requirements for the installation of gates to control the discharge from Quabbin Aqueduct into Wachusett Reservoir.

East Branch Baffle. — Studies were continued and designs completed for a baffle across the East Branch of the Swift River, including a conduit, the closure of which will divert the entire flow of the East Branch northerly so that the flow from the Ware discharged at Shaft 11A and from the East Branch will have the important benefit of longer storage in the main body of Quabbin Reservoir.

Shaft 12. Swift River Intake. — Studies were continued of the requirements for power to operate the shaft hoist and to furnish lights. For this purpose a gasoline-driven generator of 15 kilowatts capacity equipped with automatic starting devices will be installed in a room in the service building.

Shallow Flowage. — Studies were continued of the possibility of eliminating certain areas of fluctuating shallow flowage on the margins of Quabbin Reservoir by the construction of low dams to maintain the water level in such areas, when the main reservoir is drawn down.

Dike Embankment. — Studies were made of the quality of the materials in the dike embankment as revealed by tests of samples taken periodically from the embankment, including samples from the observation well in the interior of the impervious core, in order to assist the field office in the proper control of the character of borrow pit materials used in the hydraulic sluicing.

Main Dam Embankment. — Studies were continued and designs completed for the embankment of the main dam, including plans for the permanent closure of the stream control tunnel to be made upon completion of construction of the main dam embankment.

Office Buildings and Boathouse. — Studies were continued and designs were in progress for the permanent office and maintenance buildings near the site of the main dam. These will be located at the west end of the dam, between the dam and emergency spillway, and will command an extensive view of Quabbin Reservoir. They will include a central three-story administrative office, garage, storage sheds, two residences, and a combined boathouse and hangar.

Main Dam Spillways. — Studies and designs were completed of the main spillway and discharge channel at the east end of the main dam. Designs were completed for the emergency spillway at the west end of the dam consisting of the grading of a channel across the natural divide, 100 feet wide, about 550 feet long and 6 feet above the elevation of the main spillway at the west end of the dam. The emergency spillway includes a thin concrete arched wall or dam built below the surface of the channel and extending about 15 feet to ledge, to prevent deepening this outlet channel, in the extremely remote contingency of its being overflowed.

Power Development at Main Dam. — Studies were continued of the requirements of hydroelectric power development at the outlet works downstream from the stream control tunnel at the main dam, and designs made for the foundations of these outlet works.

Roads. — Studies were continued of substitute highways around Quabbin Reservoir and designs made for culverts.

Access Roads to the Main Dam. — Designs were completed for access roads to the main dam, including an approach from the Ware-Belchertown highway, Route 9, across the emergency spillway channel at grade, to the proposed group of administration buildings and thence to the west end of the dam; and an approach to the east end of the dam from the same Ware-Belchertown highway, with a masonry arch bridge across the discharge channel from the main spillway.

Aerial Maps. — In connection with the investigation of Lake Cochituate as required in Chapter 18 of the Resolves of 1936, an aerial survey was made of the watershed of Lake Cochituate, scale 1 inch = about 840 feet, and a mosaic map prepared. An aerial survey of the watersheds tributary to Sudbury reservoirs, the Wachusett Reservoir, the Ware River above the intake at Coldbrook, and the Quabbin Reservoir was in progress preparatory to the preparation of mosaic maps on a scale of 1 inch = about 800 feet. The photographs are being taken by the 101st Photo Section, 26th Division Air Service, Massachusetts National Guard.

Quinapoxet River Diversion.—Studies were continued relative to diverting into the aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

Photographic Records. — The taking of moving pictures from time to time to illustrate the progress of the work was continued.

Record Plans. — Progress was made on the preparation of record plans of the Ware River intake works and Quabbin Aqueduct.

Diversion of Industrial Wastes. — Studies were continued of methods of diversion of objectionable wastes into the Rutland-Holden sewer constructed under Contract 39.

QUABBIN RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Aqueduct Division until October 31, and thereafter the Quabbin Reservoir and Aqueduct Division, continued in charge of the work on the Ware

River watershed, of the maintenance of the Rutland-Holden sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, and of the construction of the East Branch Baffle, the buildings at the tops of Shafts 9 and 12, and the outlet works at Shaft 11A.

The Quabbin Reservoir Division until October 31, and thereafter the Quabbin Reservoir and Aqueduct Division, continued in charge of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, and of the construction of the dike embankment and relocated highways. The construction of the core wall at the main dam under Contract 38 continued in charge of Senior Civil Engineer Frederick W. Gow, reporting directly to the Headquarters Office, being practically completed at the end of the year.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 38, 50, 51, 52, 54 and 55, monthly estimates for Contracts 47, 49, 53 and 57, and the final estimate for Contract 43 were prepared. Additional real estate plans were prepared of miscellaneous properties in the Ware River watershed, final tracings being made of about 1,300 acres, making a total to date of about 1,500 acres. Record tracings of the plans showing the Ware River drainage divide were continued. Topographic maps were made of miscellaneous swamp areas in the Ware River watershed, the area in the vicinity of the tunnel outlet at Shaft 11A, and of other miscellaneous areas as required. Areas in the vicinity of Lake Cochituate were mapped and studies of possible diversion works called for in the provisions of Chapter 18 of the Resolves of 1936 were made in cooperation with the Framingham office of the Metropolitan District Commission. Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield. Continuous records of the flow of the Swift River were kept at the main dam site. Work on record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem was continued. Photographs of the progress of construction were taken.

Miscellaneous Field Work

Lines and grades were given for construction under Contracts 38, 47, 49, 50, 51, 52, 53, 54, 55 and 57. Surveys were made to determine the area and capacity of various ponds in the Ware River watershed. Daily readings of the ground water level and of numerous test wells were continued during construction operations at the main dam and dike. Observations were made of the elevation of Morton Pond, which was used to supply the make-up lines for the sluicing operations at the dike, and of the flow in the brook downstream. At the end of the year the water level stood 16 feet above the original surface of Morton Pond and within one foot of the point at which the flow will be diverted northerly into the Swift River. During the great flood in March, the engineering force continued, under very difficult conditions, the collection of samples, measurements of flow and collection of data on flood heights, which were made available to the U. S. Geological Survey and the Works Progress Administration for their use in preparing extensive reports on the flood conditions. The flood necessitated new rating curves for the measuring stations on the Ware River at Ware and on the Swift River at the diversion channel. Additional stone bounds were set defining property acquired by the Commission in the Ware River drainage area. Monthly inspections and reports were made of conditions found at all shaft heads along the Quabbin Aqueduct.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water and sewage effluents. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

In connection with studies of the method of construction of the main dam and dike, surveys of topsoil and of glacial overburden were continued in the vicinity of both structures.

Operation of Ware River Intake Works

The Ware River intake works were maintained ready for operation whenever required. The tunnel was entered for inspection through Shaft 8 on April 8, 15 and 16, May 19 and November 16.

Operation of Rutland-Holden Sewer

The Rutland-Holden sewer was in continuous operation. The meter stations at the Rutland State Sanatorium, at the U. S. Veterans Hospital in Rutland, and at the Holden-Worcester boundary line were inspected regularly and weirs and piezometer connections cleaned and records of flow maintained.

Ware River Watershed — General

A small labor force was employed throughout the year on miscellaneous work in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 head house, setting stone bounds, filling cellar holes, grading and cleaning up at the sites of buildings removed from the Ware River watershed and other miscellaneous work. The average number of men so employed on force account was 8, the maximum being 17 during the week ending May 23.

Quabbin Reservoir — General

Topography. — Topography in the area below the flow line of the reservoir was continued. To date, 30,940 acres or 48.3 square miles have been surveyed for the general topographic maps within and adjacent to the proposed reservoir, including the location of the entire flow line. Location of the flow line and of the clearing line was also determined in connection with the work of clearing.

Real Estate. — Properties described in applications by owners for sale of real estate were located and when no surveys had been made sketches showing the approximate location were prepared. Comprehensive real estate surveys and analyses and descriptions of deeds were continued. Real Estate surveys during the year cover 157 acres, making a total to date of 64,264 acres or 100.41 square miles. Of this total, 62,398 acres have been plotted on a scale of 1 inch = 200 feet.

Photography. — The photographing of buildings and cemetery lots within the area to be affected by the proposed reservoir was continued. During the year 61 photographs of buildings, 701 photographs of miscellaneous views and of the progress of construction at Quabbin Reservoir and elsewhere, and 117 photographs of property in the Ware River watershed were taken.

Cemetery Removals. — Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. During the year work progressed as shown in the following table:

CEMETERY REMOVALS

		To Nov. 30, 1935†	Year Ending Nov. 30, 1936	Total
Burial lots in Quabbin Park Cemetery assigned in exchange		521	63	584
Burial lots in Quabbin Park Cemetery sold . . .		20	2	22
Number of releases executed of rights in old lots in Quabbin Reservoir area	to Q. P. Cemetery	292	94	386
	to other cemeteries	158	13	171
Bodies removed from Quabbin Reservoir area	to Q. P. Cemetery	1,640	541	2,181
	to other cemeteries	825	20	845
Bodies removed from area outside Quabbin Reservoir to Quabbin Park Cemetery		3	—	3
Burials, not reinterments, in Q. P. Cemetery		71	18	89
Headstones moved	to Q. P. Cemetery . . .	928	324	1,252
	to other cemeteries . . .	396	11	407
Monuments moved	to Q. P. Cemetery . . .	175	41	216
	to other cemeteries . . .	137	2	139

† Includes corrections of previously reported data. Quabbin Park Cemetery was not completed ready for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

The vault was maintained and used from time to time during the winter months. Work of developing Quabbin Park Cemetery was continued by grading and seeding miscellaneous areas outside the established lots and by miscellaneous clearing and grubbing where trees interfered with the setting of stones. Cemetery lots were graded and seeded as removals were completed and in the case of purchases were graded and seeded at once. The average force employed on cemetery work during the working season of about 46 weeks was 10 men, the maximum being 15 during the weeks ending July 11 and August 15.

Fire Protection. — The fire-fighting equipment was maintained in readiness for service at all times. Six assistants in the division office were reappointed as deputy forest wardens in each of the towns affected by the reservoir. The equipment and personnel responded during the year to calls for assistance at 10 forest fires which burned over a total area of about 103 acres. There also occurred a total of 11 fires in buildings, 6 of which were chimney fires resulting in little if any damage.

Lumbering. — The New England Box Company continued its cutting operations under agreements with the Commission for the purchase of standing timber. Agreements for sale of timber were also in force with Willis B. Tryon, The Child Lumber Corporation and Chaffee Brothers. In addition, miscellaneous standing timber at various places throughout the valley has been sold to other operators and cut under the general supervision of this division.

Reforestation. — The general program of reforestation was continued with nursery stock purchased by the Commission on Administration and Finance. Planting of five and six-year-old Norway spruce transplants was commenced April 29 and completed May 18 on approximately 170 acres of the middle and lower portions of the "Prescott Peninsula," and was confined to open areas requiring no clearing. A total of about 62,000 five-year transplants, 143,000 six-year transplants and 1,000 red and white pine three-year root-pruned seedlings were planted.

Reforestation was also carried on in the Ware watershed. About 106,560 six-year Norway spruce transplants, 8,625 five-year white spruce transplants, 50,000 four-year white spruce transplants, and 5,550 two-year larch seedlings were set out on about 140 acres of the Commission's land in Coldbrook and vicinity and in West Rutland.

Since the beginning of the reforestation program in the spring of 1935, the Commission has established four nurseries. The first nursery was on about two acres of what was formerly the James S. Twible farm in Greenwich on highway Route 21 near Greenwich Lake. It now contains about 500,000 four-year white pine transplants, available for planting next spring.

The second nursery was established on about two acres of what was formerly the Stillman A. Smith farm in Ware, east of Beaver Brook and just north of highway Route 9. It now contains about 65,000 red pine four-year transplants and about 50,000 Norway spruce four-year transplants, available for planting next spring. As previously reported, the 288,800 red pine seedlings planted in this nursery were very badly affected by a fungus blight, known as Lophodermium Pinastri. The 68,000 remaining alive in the spring of 1936 were lifted and transplanted in a concentrated group and sprayed during the growing season with a solution of copper sulphate, hydrated lime and casein soap, by which treatment the disease was brought under immediate control.

The third nursery was established on about four acres of what was formerly the Jason Thurston farm in Enfield, on highway Route 21. The area was about equally divided between seed beds and transplant beds. Seed beds were constructed 4 feet wide with wooden side frames of 1-inch by 8-inch pine boards. Planting of seed was started May 16 and completed June 3. The following quantities of seed were planted and at the end of the growing season it was estimated that the following number of seedlings were growing in the seed beds:

	Pounds of Seed	Number of Seedlings
White Pine	92	2,250,000
Red Pine	63	2,000,000
White Spruce	23	1,000,000
Red Spruce	15	500,000
Norway Spruce	18	600,000
European Larch	41	500,000
Hemlock	9	150,000
	261	7,000,000

Two hundred thousand white pine, 280,000 red pine, 25,000 white spruce, 45,000 Norway spruce and 30,000 red spruce seedlings were purchased from outside nurseries and planted in the transplant area. This work was started April 28 and completed May 9. The red pine plants were sprayed frequently to prevent the possible occurrence of fungus infection.

The fourth nursery was established on about 10 acres of what was formerly the

Charles D. Randall farm in Belchertown. It is above the future flow line of the reservoir and near the main dam and hence can be maintained as long as needed for nursery planting in connection with the future development of the reforestation program. The entire area had formerly been cultivated and was plowed and thoroughly harrowed in April and May. Eight hundred pounds of buckwheat sown May 16 was plowed under the latter part of June. Barley was sown the latter part of July and this will be plowed under next spring. The nursery work in this location was practically confined to the construction and planting in the fall of seed beds 4 feet wide, aggregating 4,200 feet long.

For winter protection, a straw mulch was placed over the seedlings in the Thurston nursery and a pine-needle mulch with a burlap covering over the seed beds in the Belchertown nursery.

A labor force with a maximum number of 27 was employed on force account during the short period of planting and an average of about 8 during the season of work in the nursery.

From time to time during October and November, about 7,000 plants and shrubs were collected from the reservoir area and transplanted in the Belchertown nursery. In addition to spruce, pine and cedar, laurel, ground juniper, azalea, spirea, syringa, privet and other shrubs were planted.

Gypsy moth control adjacent to areas planted to pine was carried on during December, January and February. This work included the cutting of gray birch, poplar, cherry, oak, alder and other species which are hosts of the gypsy moth, and creosoting of gypsy moth egg clusters.

Clearing. — Recutting of brush which had grown up in the 100-foot strip cleared for fire protection in 1935, along the future flow line on the easterly slopes of the West Branch of the Swift River, was begun October 26 and completed November 6. Burning of refuse and cleaning of cellar holes following the sale and removal of buildings was continued.

A general program of clearing acquired areas to be flooded by Quabbin Reservoir was commenced about May 1 by labor employed directly by the Commission. The clearing operations were carried on in the towns of Enfield, Belchertown, Hardwick, Greenwich, Prescott, New Salem, Petersham and Dana. The work was done at this time, some two years earlier than desirable, as an unemployment relief project. Registrations for employment commenced the latter part of April in both the Enfield and Boston offices. Appointments to the work continued until November 7. Of a total of 5,878 appointees, 4,289 reported and were assigned to work. The maximum number of men at work was about 3,200. At the end of the year there were 938 men employed and the clearing was nearly completed.

The work of clearing was divided into six sections containing generally from 500 to 600 men, each section being subdivided into groups of approximately 40 men. The work consisted of the cutting down and piling of all brush and small soft-wood trees. White and yellow pine and hard woods suitable for timber or ties were left standing. Other suitable hard woods were salvaged for cordwood, cut into 4-foot lengths and piled. A small quantity of yellow pine and oak was sold and cut into lengths in accordance with the terms of sale.

The equipment used consisted of small tools such as axes, brush hooks, brush scythes, cross-cut saws, grindstones, forks, shovels, etc., and seven 1½-ton stake-body trucks, four pickup trucks, ten four-door sedans. The stake-body trucks were used for transporting drinking water in 40-quart cans from one of several central points of supply to each group, for hauling the excrementitious material from the outhouses at each group and for transporting tool boxes, outhouses and equipment from one location to another as the groups moved about. The pickup trucks were used for transporting tools and small equipment to and from the stock room and repair shop and the various groups and for miscellaneous errands around the job.

The building, formerly occupied by the Haskell store in Enfield Village, was maintained as a storehouse for tools and small equipment and as a shop for repairing broken tools, filing saws, etc. A doctor's office, under the supervision of Dr. Willard B. Segur of Enfield, was maintained on the second floor of the clearing project office where medical and surgical treatment was administered to men injured on the work, Burning the brush cut in the reservoir clearing operations has been in progress.

Soil Testing Laboratory. — The work of exploring, collecting and testing materials to be used in the construction of the main dam and dike, together with current control tests of the quality of the material placed in these structures was continued. New equipment was added to the laboratory from time to time as testing methods were expanded. Tests were principally of the permeability, stability and related characteristics of soils affecting their use in hydraulic-fill and rolled-fill embankments. Use of the plasticity needle was continued. Samples from storage piles and from the spillway excavation were collected as required for preliminary testing to determine their suitability for use in the embankments. The investigation of possible areas for the supply of materials for the full-hydraulic type of construction for the main dam embankment was continued in this connection. The weathered faces of shovel cuts were cleared for inspection by prospective bidders and data prepared showing the results of subsurface investigations in these borrow areas.

Size distribution analyses supplemented by permeability and porosity tests were used for the routine control of the quality of the beach and core materials placed by the full-hydraulic method in the construction of the dike embankment. Whenever it was discovered that fins of unsuitable material projected into the core, the areas affected were jetted and resampled to determine the improvement effected by the jetting. Samples were collected daily from the hog-box hopper for sizing tests. The water in the central pool was examined weekly for turbidity. Samples from the settled core were obtained periodically through the ports of the observation well and tested for size gradation and porosity to determine the extent of consolidation. This investigation was supplemented by tests of additional samples obtained from sampling wells sunk by driving 2½-inch pipe casing.

Samples of beach and core material undisturbed from the sampling well ports and samples from the glacial till in the rolled section of the impervious core were collected, tested for porosity and size gradation, and submitted to the Harvard Soil Mechanics Laboratory for shear determinations. Prior to the discontinuance of the full-hydraulic method of placement, deposits of glacial till in a borrow area northeast of the dike were sampled and tested for permeability to determine their suitability for use in topping off the dike with rolled fill. Grading and moisture tests were made of concrete aggregates and slump tests were made on concrete samples. Miscellaneous testing included absorption tests on bricks for catch basins and manholes in connection with highway construction. Methods and equipment were developed to test 70 samples per day for grain-size distribution, in order to keep pace with the sampling schedule used in the construction of the dike hydraulic embankment.

Chemical and Bacteriological Laboratory. — The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued. To obtain suitable water supplies for the men employed on the reservoir clearing project, springs, wells, small brooks and other sources in the vicinity of the work were examined. During the early summer it was possible to find sufficient water near at hand. Springs and wells frequently became dry and undependable in midsummer and a number of supplies with good yields were located and water furnished to the various groups in 40-quart cans. Toward the end of the summer the major supply was taken from Egypt Hill Brook. A small portable gasoline-driven centrifugal pump was installed to pump water from the brook directly to the cans which were transported to points of use on trucks. The water was chlorinated. The number of men employed on the clearing project averaged about 3,000 during the greater part of the summer, and no illness that could be traced to the water supply was reported.

Progress of Contracts

Contract 38. — Contract 38, for constructing a core wall to sound rock at the site of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware was continued and practically completed. In addition to the work originally contemplated, the contractor was authorized on May 8 to excavate earth in that portion of the spillway channel between the railroad and a point approximately 1,600 feet therefrom, suitable materials from this excavation to be placed in the embankment of the main dam to prepare the foundation grading in readiness for the work of completing the embankment by hydraulic sluicing under a subsequent contract. This building up of the foundation embankment required an additional amount of rolled impervious material to be placed in the core foundations. At the same time the contractor was authorized to construct two access roads from the Ware-Belchertown highway, one on the east leading to the spillway site and the other on the west to the site selected for the administration buildings.

The contractor continued pumping from the caissons to keep the ground water level down until July 3. The total quantity pumped during the year in operations for lowering the ground water level was 848 million gallons, making a total during the entire work of the contract of 1,738 million gallons. The average pumpage from December 1 to June 20 was 2,862 gallons per minute, after which time only a small quantity was pumped. At the beginning of the year all but five of the 40 caissons were completed. Sinking, underpinning and cleaning ledge were continued until the last concrete seal was placed on January 5. For the entire contract the average rate of sinking in free air was as previously reported, 9.77 feet in 24 hours and under compressed air the average was 3.63 feet. The maximum depth reached was 125 feet below the original river bed. The maximum air pressure used was 33 pounds in caisson 12. The pressure was 18 pounds or less in 21 of the 37 caissons, 18 to 26 pounds in three and over 26 pounds in four. There were 327 caisson days of pressure below 18 pounds, 72 between 18 and 26 pounds and 15 between 26 and 30 pounds. At the beginning of the year the excavation of end joints was 60 per cent completed. The excavation was continued, by methods that were described in the annual report for 1935, until completed on February 4. Only 21.3 per cent of the total length of end-joint excavation was done under compressed air.

To complete the easterly end of the cut-off wall formed by the caissons, a reinforced concrete wall was extended in open cut to the ledge in the abutment. At the end of this wall a concrete blanket was placed on the ledge, through which the ledge was grouted. The blanket on the west end was extended a short distance beyond that completed last year. The concrete was placed August 12. The wells in the caissons, above the concrete filling of the working chambers, were filled with topsoil compacted by dropping a tamping weight operated by hoist and A frame. This work was completed August 13. Piezometer pipes were connected to the well points left in the upstream and downstream sides of the central wells in caissons 7 and 20. The pipes were carried up these wells which were filled with concrete to elevation 390, or about 10 feet above the original bed of the river. Each of these wells will form the lower section of a steel pipe observation well to be constructed to the top of the main dam embankment under a subsequent contract.

Drilling for grouting operations was continued, except during the winter months from December 28 to March 30, and was completed July 24. During the entire contract a total length of 2,278 feet outside and 10,892 feet inside the caissons was drilled. Grouting operations were continued, except during the winter months from December 21 to March 31, and were completed August 14. During the entire contract a total of 1,614 cubic yards of grout was placed within the caisson limits, 71 cubic yards outside these limits in the ledge of the abutments and 216 cubic yards in filling the 24-inch pipe line used as a discharge line from the unwatering pumps.

The placing of rolled impervious material was continued, except during the winter months from December 5 to April 8, and was completed August 25, the total for the contract being 154,845 cubic yards. This filling was carried to elevation 404 across the main central portion of the embankment foundations. The bulk of the material was obtained from the borrow area northwest of the site adjacent to the Blue Meadow road, from borrow areas on either side of the Enfield-Bondsville road north of the dam and from the main dam site itself. About half of the total quantity was stocked and rehandled before placing, the other half being used directly from the stripping. The pervious embankment on either side of the central impervious core was graded to form beaches with 5 per cent slopes in readiness for the work of hydraulic sluicing under a subsequent contract. The material was obtained largely from the excavation of the main spillway channel. This pervious embankment foundation was completed except for a small area north of caisson 9.

Earth excavation in the spillway channel began May 11. A maximum of 4 shovels and 24 trucks was used. Suitable excavated material was placed in the dam foundations. Boulders were placed in the stone fills in the downstream portion of these foundations and unsuitable material was wasted in the abandoned river bed downstream from the dam. Practically all the earth excavation required in a length of about 1,600 feet between the old railroad location and a temporary access road across the proposed spillway was excavated. No ledge was excavated.

Between May 11 and August 26, 2,000 feet of gravel access road was constructed from the Ware-Belchertown highway (Route 9) at a point about 4,500 feet east of the Swift River to a point about 600 feet east of the location of the future spillway bridge. Between May 25 and August 14, a penetration macadam road from Route 9, 4,700 feet west of the Swift River, was built to the site of the proposed group of administration buildings about 500 feet from the west end of the dam. This road is about 1,750 feet long and in addition has a 560-foot branch which will provide access to the future boathouse and hangar. In connection with the construction of this road, which crosses the auxiliary spillway channel at grade, that portion of the auxiliary spillway channel north of the road was excavated.

There was also included as part of the work of this contract the clearing and excavating of 7 exploratory shovel cuts in borrow areas proposed for the work of hydraulic sluicing for the construction of the main dam embankment under a subsequent contract, in order that prospective bidders might examine these materials. About 4 acres were cleared and 22,364 cubic yards of material excavated in these shovel cuts. The work of cleaning up the site of operations was nearly completed at the end of the year.

The value of work included in contract estimates during the year was $545,946.23, or a total to October 1, the date of the latest estimate, of $1,567,775.23, of which $1,485,997.71 was approved for payment. The contractor's force averaged 102 men for 40 weeks ending September 9, and 10 men for the remaining 12 weeks, the maximum being 265 for the week ending December 12, 1935. Camp facilities have not been provided at the work.

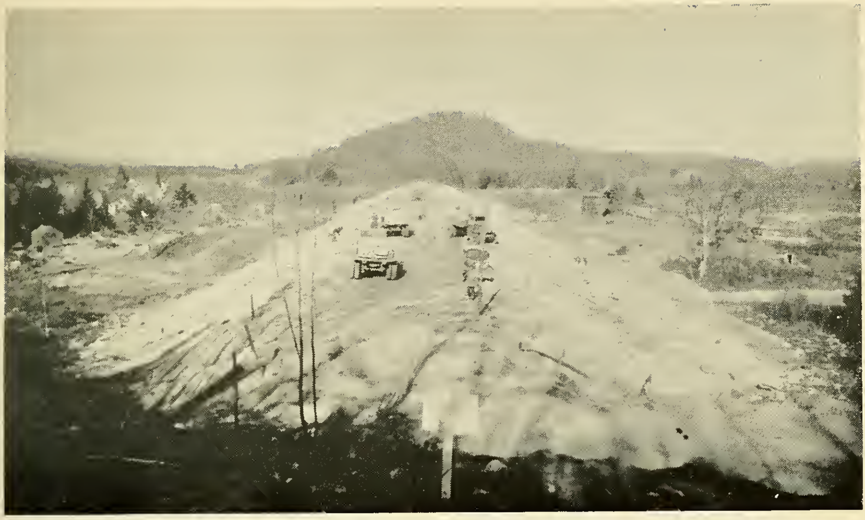
The total electric energy used by the contractor during the year was 1,272,625 kilowatt hours, making a total for the entire contract of 2,923,580 kilowatt hours.

No important items of plant were added during the year.

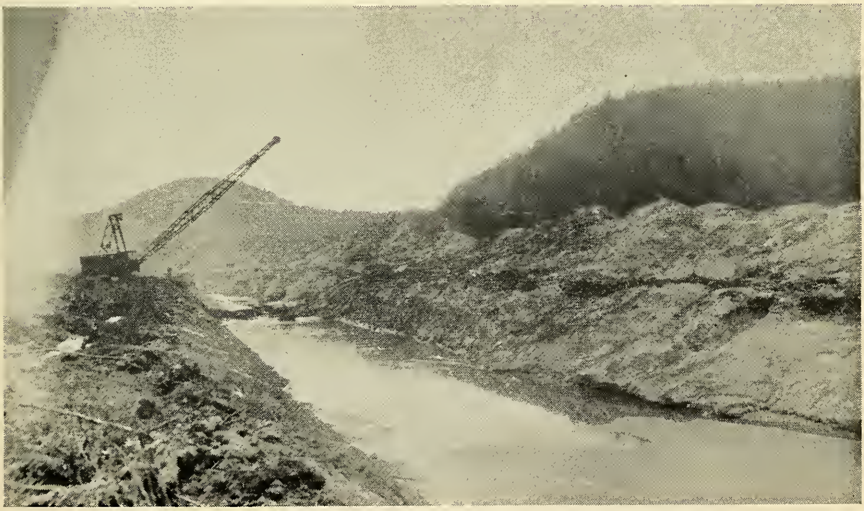
The total work done and materials furnished to date under the principal items of Contract 38 are as follows:

Earth excavation in open cut	523,385 cu. yds.
Rock excavation as boulders in open cut	1,230 " "
Rock excavation as ledge in open cut	14,750 " "
Stripping	76,390 " "
Unconsolidated embankment	53,940 " "
Consolidated pervious embankment	376,610 " "
Rolled impervious embankment in core	154,845 " "
Rolled impervious embankment not in core	41,315 " "
Stone fills	52,575 " "
Pumping	166,180 mil. ft. gals.
Earth excavation for core wall, bottom of open cut to elevation 300	34,265 cu. yds.
Earth excavation for core wall below elevation 300	4,235 " "
Rock excavation in caissons to elevation 300	2,595 " "
Rock excavation in caissons below elevation 300	655 " "
Concrete not placed under air pressure	47,600 " "
Concrete placed under air pressure	6,260 " "
Impervious filling in caissons	4,415 " "
Drilling holes in rock or masonry	13,170 lin. ft.
Furnishing and placing grout	1,900 cu. yds.
Portland cement	81,110 bbls.

Contract 47. — Bids were opened April 17, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich. Four bids were received, ranging from $34,990.00 to $45,380.00. The contract was executed May 4 with Vincent Caira, Newtonville, Mass., the low bidder. The head house is a stone masonry building about 44 feet by 30 feet on the shaft substructure built under the tunnel contract, numbered 20. This building will house a hoist giving access to the tunnel and providing for cleaning screens and handling stop shutters. The service building, located about 240 feet east of the head house, is also a stone masonry building and will contain garage space for two service trucks, a room for emergency housing of operators, and will house a gasoline-



Contract 51. — Construction of East Branch Baffle Across East Branch of Swift River at Greenwich Village.



Contract 49. — Drag-Line Excavation of Open Channel Between East and Middle Branches of Swift River.

driven electric generating plant, furnishing lights for both buildings and power to operate the equipment in the head house.

Excavation for footings for the service building was started May 18. All the foundation work, including waste-treatment tank and cradles for the gasoline tank, was completed June 25. The first stone was delivered on June 10 and placing of ashlar masonry started July 30 and was completed October 9. The placing of tile for the inside walls was started July 27 and was completed November 17. The erection of lintels and door frames was completed August 31. Erection of steel roof members was completed October 5. At the end of the year work was in progress on the placing of roof slabs, mortar protection of steel roof members, installation of steel sash and electric wiring.

For the head house, the erection of structural steel, which was delivered August 24, was completed November 30. The placing of ashlar masonry was started September 17 and completed November 22. The placing of tile for the inside walls was started September 22 and was practically completed at the end of the year. The placing of roof slabs was started November 20 and was completed November 30. At the end of the year work was in progress on the installation of bronze work and electric wiring.

The value of work included in contract estimates to November 15, the date of the latest estimate, was $27,117.25, of which 90 per cent was approved for payment. The contractor's force averaged 7 men for 28 weeks ending November 30, the maximum being 15 for the week ending October 10.

Contract 49. — Contract 49, for excavating diversion channels at the site of Quabbin Reservoir in the towns of Dana, Hardwick and Greenwich, was continued and at the end of the year was practically completed with the exception of some minor items connected with the cleaning up of the area in the vicinity of Shaft 11A.

Excavation of the lower intake channel at Shaft 12 was continued except during the winter months. The spoil was spread by a bulldozer to a depth of about 2 feet over an area immediately south of the channel. This work was completed May 8.

At the channel between the East and Middle branches of the Swift River clearing was completed, the total area cleared being about 45 acres. Excavation of the channel was continued with a drag line until May 20, except for the period between January 11 and March 16 when this equipment was used on the channel at Shaft 11A. The 90-horsepower caterpillar scraper wagon was continued in use excavating the full width of the upper portion of the channel ahead of the drag line and also spreading the spoil excavated by the drag line. The excavation was completed October 21, the spoil being spread over areas adjacent to the channel up to a maximum elevation about 20 feet below the future flow line. The scraper was also used to construct the fill of the road relocation. A gravel surface was then placed on this fill and the road was surfaced with bituminous material. A wooden guard rail was constructed along the west or channel side.

A wooden bridge was built across the channel near its southerly end to carry the Greenwich-Athol road, and the grade of the road was lowered for about 200 feet on each approach. The material encountered at this point was mostly fine sand, in which it was necessary to lower the water table by pumping. Excavation was continued below grade under the bridge bents and a foot of gravel placed for bearing under the sills. The bents were framed and placed by the drag line used as a crane. The channel slopes were paved the full width of the bridge with 12 inches of stone over 6 inches of gravel. Paving was also placed at several other points along the channel banks to prevent erosion by surface water. The bridge was opened to traffic May 18.

At Shaft 11A clearing was completed, the total area cleared being about 54 acres. Suitable material for lumber was sawed by a portable sawmill. Grubbing of stumps was started January 15. After unsuccessful attempts to pull the stumps, first with the drag line, and later with block, tackle and horses, two caterpillar tractors were used until March 20. About 10 acres were cleared and grubbed, the tractors pulling up trees and roots as a unit. On May 18, grubbing was resumed, generally by the use of dynamite. Brush and stumps were piled and burned, this work being nearly completed late in October. The channel, for a length of about 800 feet from the shaft, with an average depth of about 6 feet, was excavated early in March by the drag line, supported on timber pads where required. The caterpillar scraper wagon was used July 8 to 29 for disposal of the spoil. The north end of the channel was extended about 525 feet by hand excavation of a shallow ditch during the week ending September 18. Work on this contract was practically completed at the end of the year.

The value of work included in contract estimates to October 10, the date of the latest estimate, was $84,766.32, of which 90 per cent was approved for payment. The contractor's force averaged 18 men for 48 weeks ending October 31, the maximum being 55 for the week ending August 1.

The principal items of plant were as follows:

1 Caterpillar scraper wagon, 12-cu. yd. capacity, 90 H.P. Diesel engine
1 Drag line excavator, 70-ft. boom, 2⅓-cu. yd. bucket, 150 H.P. gasoline engine
2 Caterpillar bulldozers

The total work done and materials furnished to date under the principal items of Contract 49 are as follows:

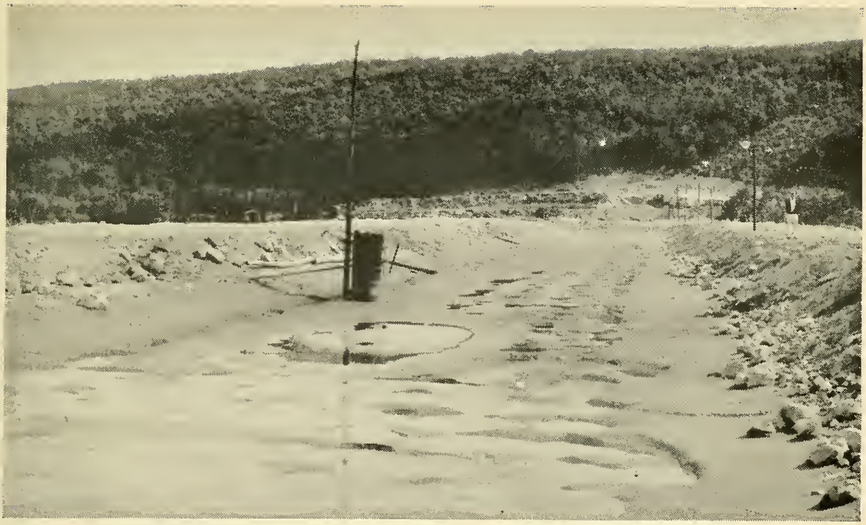
Clearing	102 acres
Grubbing	50 "
Earth excavation in channel between Middle and East branches	229,500 cu. yds.
Earth excavation in channel at Shaft 11A	5,500 " "
Earth excavation in channel at Shaft 12	12,550 " "
Grading banks of lower intake channel at Shaft 12	2,260 " "
Gravel road surfacing	2,075 " "
Paving	315 " "
Highway bridge	30 m. ft. b. m.

Contract 50. — Contract 50, for constructing the embankment of the dike of Quabbin Reservoir in the towns of Enfield and Ware, was continued throughout the year. The placing of hydraulic fill was discontinued during the winter months from December 3 to March 31. Hydraulic fill was then placed continuously 24 hours a day and 6 days a week until September 20. It was then decided that the hydraulic fill had been carried to a sufficient height and the contractor was permitted to complete the remaining portion with a rolled fill. A water jet was used along the outer portions of the core to break up fins or intrusions of coarse material into the core area. This jetting was done by a vertical pipe suspended from a boat with water pumped directly from the core pool. When the hydraulic fill was discontinued, the average elevation of the core was 514.3, which is 15.7 feet below the flow line and 35.7 feet below the finished top of the dike.

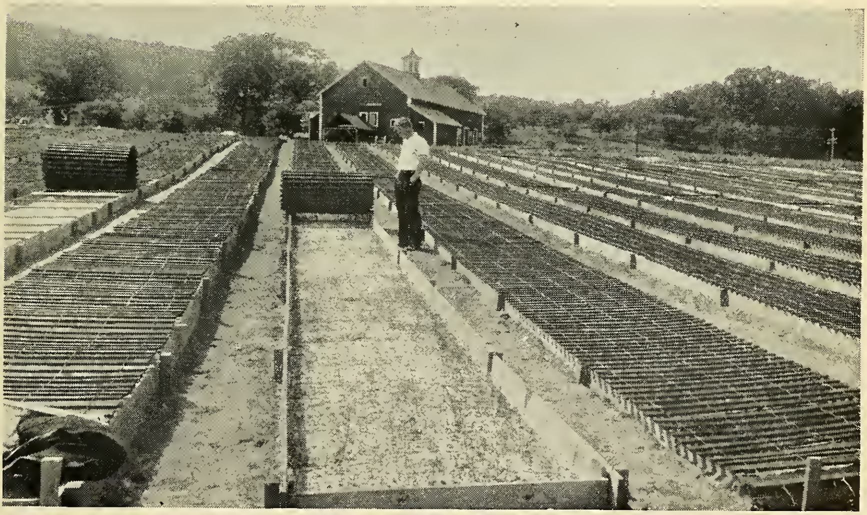
After the hydraulic fill was stopped, three dikes were built across the core pool dividing it into sections. After settlement and consolidation for three days, the water was pumped out and the placing of dry impervious fill over the core area commenced September 21. After the first layer was placed, no difficulty was experienced in getting onto the core area with men and equipment. Suitable impervious material was found in the northeast borrow area from which the contractor had previously secured impervious topsoil. This material was a blue glacial till with a large variation of grain size. The desired degree of imperviousness was obtained by careful selection. Coarse sand and gravel for topping off the outer portions of the embankment were obtained from the southwest borrow area. Materials were placed in layers, consolidated with water and rolled with a sheep's-foot roller.

About 1,233,500 cubic yards were placed by the full-hydraulic method during the year, making a total placed by this method under the contract about 1,760,000 cubic yards. About 210,000 cubic yards of the rolled fill were placed at the end of the year, the total embankment being about 92 per cent completed.

The materials for protecting the upstream face from wave action, consisting of a layer of broken stone covered by riprap, were obtained from stones rejected by the hog-box grizzly and by stone hauled from the northwest borrow area. A crusher plant set up near the hog box furnished the broken stone, and a locomotive and cars of 4 cubic yards capacity, operating over a light track which was raised as the work progressed, were used to deliver and place the materials. As the work neared the top of the dike, delivery of heavy riprap and of some of the light riprap and broken stone was by truck. This work was in progress throughout the year, the constructing of the upstream face following as closely as practicable the building up of the hydraulic embankment. During the latter part of the year, work was



Contract 50.— The Core Pool After Draining at the End of Hydraulic Sluicing Operations. The Holes are Left by Jetting Down to Break Up Fins of Coarse Material.



Reforestation. — Thurston Nursery, Enfield. White Pine Seed Beds Twenty-four Days After Planting.

commenced on the drainage system on the downstream face of the embankment, consisting of tile pipe and catch basins.

At the east abutment about 2,000 cubic yards of rock were removed from the upper portion to uncover sound ledge on the center line. The concrete blanket was completed and the ledge thoroughly grouted.

The 3-foot vertical steel cylinder shaft with observation ports in caisson 13, which will extend to the top of the dike, was raised as the fill progressed.

The value of work included in contract estimates during the year was $764,005.70, or a total to November 30, the date of the latest estimate, of $1,164,648.70, of which $1,098,183.83 was approved for payment. The contractor's force averaged 165 men throughout the year, the maximum being 285 for the week ending May 30. Camp facilities have not been provided at the work.

The total electric energy used by the contractor during the year was 3,364,800 kilowatt hours, making a total of 4,590,500 kilowatt hours to date.

The only important items of plant added during the year were one gasoline-driven shovel of 1¾ cubic yards capacity, and two bottom-dump trucks of 8 cubic yards capacity.

The total work done and materials furnished to date under the principal items of Contract 50 are as follows:

Clearing and grubbing	96 acres
Earth excavation	46,800 cu. yds.
Rock excavation for core wall	8,200 " "
Rock excavation except for core wall	2,710 " "
Consolidated pervious foundation embankment	173,000 " "
Rolled impervious embankment in core	49,400 " "
Rolled impervious embankment except in core	74,500 " "
Embankment by full-hydraulic method	1,976,100 " "
Miscellaneous embankment	12,000 " "
Selected coarse material	69,400 " "
Crushed stone or screened gravel	14,900 " "
Light riprap	56,100 " "
Gravel sub-base for roads	1,500 " "
Furnishing and placing grout	625 " "
Portland cement	9,570 bbls.
Concrete, Class A	4,760 cu. yds.
Concrete, Class B	15 " "
Miscellaneous steel and iron	33,500 lbs.
12-inch and 18-inch tile pipe	1,830 lin. ft.

Contract 51. — Bids were opened May 14, for constructing the East Branch Baffle across the East Branch of Quabbin Reservoir in the towns of Greenwich and Hardwick. Eight bids were received, ranging from $219,075.00 to $413,725.00. The contract was executed June 23 with Franklin A. Snow Company, Boston, Mass., the low bidder. This work included the construction of two earth fill dams, the larger with a concrete conduit to carry the flow of the Swift River through it as long as desired. When the main dam of Quabbin Reservoir is completed the conduit will be closed and the water from the East Branch of the Swift River and water discharged at Shaft 11A from the Ware River will flow northerly around a large island into the deep portion of the reservoir near North Dana. The length of travel of these waters to the intake at Shaft 12 will thus be increased by about 9 miles and insure the benefit of long-time storage in the Quabbin Reservoir.

Work was begun June 23 with repairs to strengthen the bridge over the East Branch of the Swift River at Greenwich Village, immediately downstream from the site of the embankment. At the same time, work was started on clearing borrow areas and clearing the site selected for a quarry from which to obtain materials for stone fills and for riprap to protect the slopes of the embankment. The excavation for the river by-pass culvert was started June 27, using a gasoline-driven ¾-cubic yard shovel. A second similar unit, rigged with a clamshell bucket, started June 30 to remove the old mill pond dam and deepen the river channel. Excavation for the culvert was completed by drag line August 3. The shovel excavated unsuitable material from the embankment foundations July 14 to 18 and then moved to a borrow area for impervious material west of the site and commenced stripping and storing the soil for use in the impervious core. The excavation operations were completed September 19.

Construction of forms for the concrete culvert was commenced July 3 and the first concrete was poured July 28. Sand and stone for concrete aggregates was trucked from Palmer and cement from West Ware. Concrete was chuted from a ¾-cubic yard gasoline mixer to a hopper from which concrete buggies carried the concrete to the forms. The invert was first poured, then the side wall forms and steel were erected. The side walls were then poured and allowed to take their initial set before the roof was poured. The conduit, including the stop-log shaft, was completed October 12. Paving at the inlet and outlet was completed August 19 and the river diverted through the culvert August 21.

Construction of the impervious core which extends from the foundation to elevation 480 was started July 25 and completed September 24. The material was hauled from storage piles in 3-cubic yard trucks, spread by bulldozers, slightly wet, and compacted by a sheep's-foot roller. The placing of pervious fill in the main embankment was started July 21. The material was excavated by a steam shovel, hauled in 10-cubic yard trucks, dumped in water and spread by bulldozers in layers approximately 8 inches thick when consolidated. When the fill reached a height where it was no longer feasible to consolidate by pooling, pervious material was spread, watered by hose line and consolidated by a sheep's-foot roller. At the end of the year the pervious fill reached elevation 531, about one foot above the flow line and 5 feet below the finished grade, except that at the west end a gap for the main highway running north from Greenwich Village was left filled only to elevation 494, or 14 feet above the bottom of the diversion channel between the East and Middle branches of the Swift River excavated under Contract 49.

On July 8, work was started on the construction of a screening plant to obtain screened gravel for facing the embankment slopes under the riprap. On September 24, a belt-conveyor unit was installed to lift the material to the rotating screen and increase the capacity of the plant. The first screened gravel was placed August 13. The pervious fill was first graded by hand and the screened gravel then dumped from trucks. Riprap and stone fills for the baffle were obtained from a quarry northeast of the site. On September 4 work was started at the quarry on tunnels for blasting. Three tunnels, 3 feet wide by 3½ feet high, were driven into the face about 40 feet. Cross tunnels at the end of each, extending 14 to 26 feet on either side, were loaded with about 5,500 pounds of 60 per cent dynamite. The larger rocks resulting from these shots were drilled and blasted. The stone was loaded by steam shovel and hauled by trucks, commencing August 17. The stone fills at the toes of the main embankment were dumped in lifts about 10 feet high. Riprap on the faces was dumped from trucks on the screened gravel slopes and was barred as required to final position.

Work was begun on the relocation of the highway along the upstream slope October 5. The gravel surface was placed and rolled and the highway was opened to public travel October 7, the paved gutters along the toe of the riprap being finished October 21.

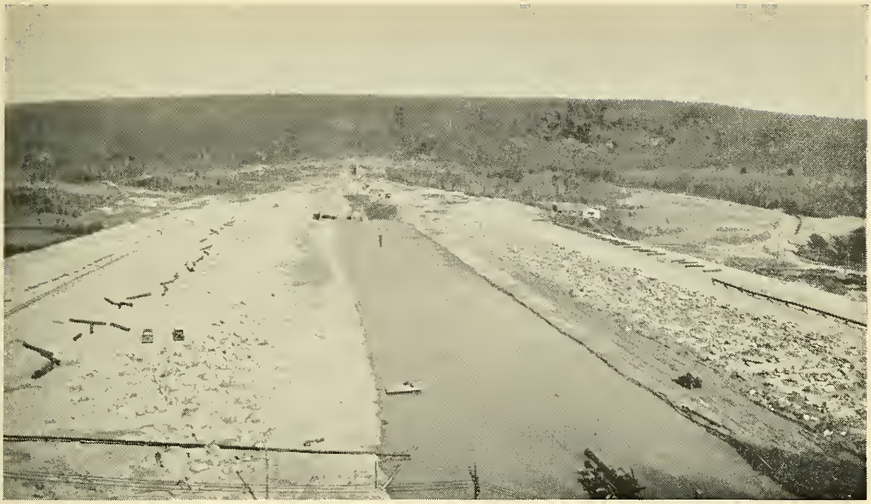
Work was started August 5 on the clearing of an access road to the south baffle, a small embankment southeasterly from the main embankment. On August 21, a 1½-cubic yard gasoline-driven shovel was started excavating the road and stripping the site. A portion of the topsoil stripped was used as impervious fill in the main embankment. The placing of fill in the south baffle was commenced November 2. The material was rolled with a sheep's-foot roller. At the end of the year, the fill reached elevation 530, about 6 feet below the finished grade. Screened gravel was placed on the slopes commencing November 3.

Lights for night work were supplied by a gasoline-driven generating plant at the main embankment. Acetylene lamps were used at the south baffle.

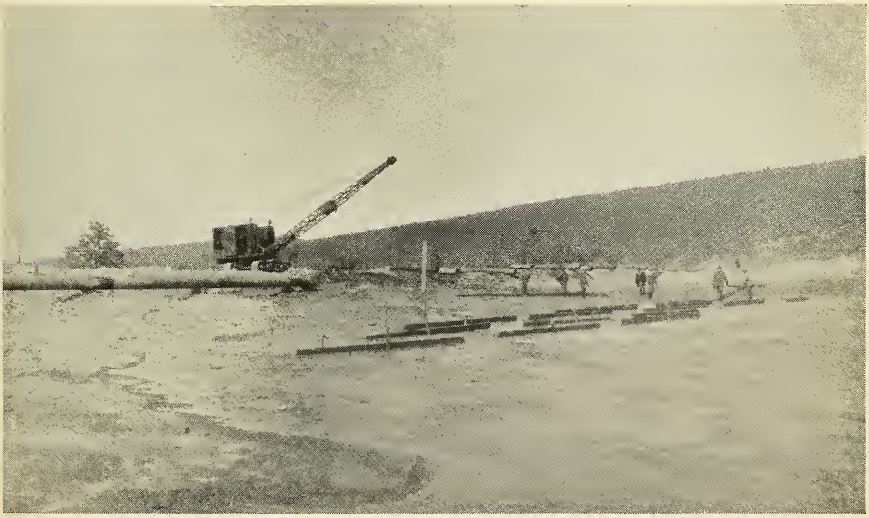
The value of work included in contract estimates to November 20, the date of the latest estimate, was $164,411.51, of which 90 per cent was approved for payment. The contractor's force averaged 60 men for 23 weeks ending November 28, the maximum being 90 for two weeks ending August 15.

The principal items of plant were as follows:

4 Gasoline shovels, ⅝ to 1¼-cu. yd. capacity, including two with convertible booms.
1 Steam shovel, 1½-cu. yd.
5 Bulldozers, 35 to 60 H.P.
6 110-H.P. large bottom-dump trucks
13 5-ton trucks
4 ½-ton trucks
1 Sheep's-foot roller
2 Air compressors, total capacity 380 cu. ft. per min.
1 ¾-cu. yd. gasoline-driven concrete mixer
1 2-H.P gasoline-driven concrete vibrator
1 Screening plant
Miscellaneous lighting units, pumps, drills, etc.



Contract 50.— Looking East Along Center Line of Dike Embankment. Filling the Central Pool, Elev. 451, in Preparation for the Season's Work of Hydraulic Sluicing.



Contract 50.— Construction of Dike Embankment by Hydraulic Sluicing. Drag Line Used to Build Up Marginal Dike. Baffle Boards on the Beach.

The total work done and materials furnished to date under the principal items of Contract 51 are as follows:

Earth excavation	39,095 cu. yds.
Pervious embankment	408,930 " "
Impervious embankment	8,545 " "
Stone fill	8,935 " "
Riprap	27,970 " "
Screened gravel	24,120 " "
Concrete	900 " "
Portland cement	1,760 bbls.

Contract 52. — Bids were opened July 2, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware. Nine bids were received, ranging from $2,317,445.00 to $4,555,800.00. The contract was executed August 24 with Benjamin Foster Company, Philadelphia, Pa., the low bidder. The work contracted for consists of constructing the embankment of the main dam, about 2,640 feet long, about 170 feet high above the original river bed and about 150 feet above the foundations and core wall built under previous contracts. The main embankment will be constructed by the full-hydraulic method. The upstream face will be protected against wave action by broken stone and riprap, and the downstream face against erosion by soil dressing. The work will include the main spillway easterly of the dam and the auxiliary spillway westerly of the dam, also the ultimate plugging of the stream control tunnel and control works connected therewith.

Work was commenced September 8 by the clearing of an area just north of the east end of the dam for the contractor's plant buildings, construction of which was started immediately. By November 14, 31 acres had been cleared, including areas for access roads. Commencing September 16, the contractor cleaned off the ledge in the east abutment and practically completed cleaning off and removing unsound ledge from the west abutment of the dam. Suitable materials from these operations were placed as riprap on the upstream cofferdam and the balance wasted in filling the abandoned river bed below the dam. To complete the concrete blankets on the ledge abutments, the contractor used the aggregate washing and batching plant used by the previous contractor on the caisson core wall. The aggregate was batched by weight into trucks each loaded with two batches and carried to a one-cubic yard concrete mixer.

In the west abutment the first concrete was placed October 24. A mixer was set on the upstream side of the cut and discharged first into a system of chutes through which the concrete was pushed to the forms. As the work progressed higher, a crane was used to handle a bottom-dump bucket from the mixer into the forms. By the end of the year, the concrete blanket had been completed to elevation 445 and about 800 cubic yards placed.

In the east abutment, where a similar blanket was placed, the concrete for the lower portion was chuted directly from the mixer, and the crane and bucket used for the higher elevations the same as for the west abutment. Concreting in this abutment was completed between November 3 and November 13, 476 cubic yards being placed.

Pipes for grouting the rock under the abutments were left through the concrete. Through these pipes holes were drilled 20 feet into the ledge, this work being in progress at the end of the year. Grouting operations were also commenced but were shut down for the season, on account of low temperature, on November 18.

The contractor began placing consolidated pervious embankment October 28 in order to complete the shaping up of the foundation beaches in preparation for the placing of hydraulic fill. The material was taken from the northeast borrow area. It was excavated partly by caterpillar scraper wagons and partly by a drag line loading into bottom-dump wagons. The bulldozers helped spread the material in approximately 8-inch layers before rolling with a sheep's-foot roller. Some of the material was consolidated by bulldozing the material into a shallow depth of water. About 15,000 cubic yards were placed before the end of the year.

Excavation of the extension of the east access road constructed under Contract 38 and of the branch road running northerly therefrom past the spillway weir was started October 8. About 8,500 cubic yards of earth and 1,900 cubic yards of ledge were excavated at the end of the year. Material was deposited in the fills required for the access road between the spillway and the east end of the dam.

Some of the large boulders and ledge fragments were placed as riprap in the upstream cofferdam.

On October 5, grading operations in the auxiliary spillway channel were started with a caterpillar scraper wagon and the trench excavation for the cut-off wall was started October 9. By November 30, the channel was roughly graded.

Concreting of the cut-off wall was started October 28, using a one-cubic yard concrete mixer, and 2,000 cubic yards, or about half of the total, were placed at the end of the year.

The value of work included in the contract estimates to November 30, the date of the latest estimate, was $60,339.00, of which 90 per cent was approved for payment. The contractor's force averaged 104 men for 12 weeks ending November 28, the maximum being 137 for the week ending November 14. Camp facilities have not been provided at the work.

The contractor's plant just upstream from the dam, on the knoll east of the old Enfield-Bondsville road, consists of a combined repair shop and stockroom, a blacksmith's shop, a combined engineer's office and first-aid building, an administrative office, an oil shed, a carpenter's and electrician's shop, a rigger's building, a canteen, two 15,000-gallon tanks for the storage of gasoline and fuel oil, a cement shed and the aggregate plant built for the work on Contract 38. To secure a supply of drinking water, the contractor dug a well 45 feet deep about 500 feet upstream from the center line of the dam. Work was in progress on the construction of plant to be used in the hydraulic work during the coming season.

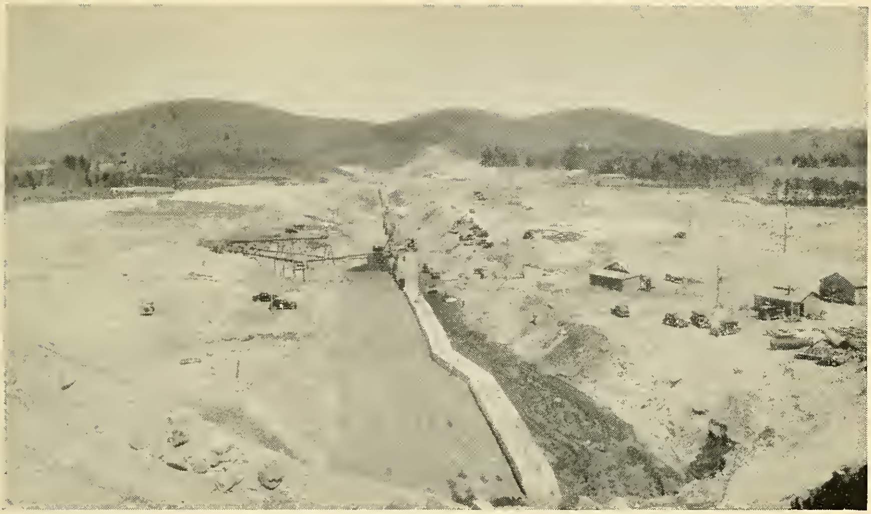
Contract 53. — Bids were opened April 24, for constructing the head house at Shaft 9 of Quabbin Aqueduct in the Town of Barre. Two bids were received, for $9,300.00 and $9,354.00. The contract was executed May 7 with The English Construction Company, Inc., Lowell, Mass., the low bidder.

This head house is a masonry building, constructed on foundations already built under the previous tunnel contract, numbered 20. It will house a hoist which will provide access to the tunnel through the shaft. The shaft also contains a ladder and platforms every 30 feet. The first stone was delivered May 24, laying the base course started June 25, and the stonework was completed September 4. The placing of tile for the inside walls was started June 30 and completed September 19. Structural steel was delivered July 14 and erected from July 20 to October 2. Roof slabs were placed October 5 and 6. Mortar protection of the steel roof beams was completed November 18 and slate roofing November 21. The entire contract was practically completed at the end of the year.

The value of work included in contract estimates to October 15, the date of the latest estimate, was $7,812.00, of which 90 per cent was approved for payment. The contractor worked intermittently and his force averaged about 3 men during the active periods.

Contract 54. — Bids were opened May 7, for the construction of 1.83 miles of road in the towns of Dana and Petersham. This new highway is in the vicinity of Nichewaug and connects existing state and county highways on the north and south, providing an excellent route east of the reservoir connecting Gilbertville and Ware on the south with Petersham and Athol on the north. Fourteen bids were received, ranging from $68,040.00 to $100,576.00. The contract was executed May 22 with Carlo Bianchi & Company, Inc., Framingham, Mass., the low bidder.

This highway is 30 feet wide with a 24-foot hard surface consisting of a 2-inch thickness of gravel mixed in place with refined tar on a gravel base varying in thickness from 6 to 16 inches, the minimum thickness being used only in locations with a natural gravel of good quality below the subgrade. Three-foot gravel shoulders were constructed adjacent to the tar surface. Three reinforced concrete culverts were constructed, the two largest being 18 feet by 10 feet at and near the crossing of the East Branch of the Swift River. In constructing the surface, bank-run gravel containing stones with a maximum dimension of 1½ inches was spread for a 2-inch thickness after compaction on the base course of gravel which had previously been fine graded. Shoulders adjacent to the surface had also been brought to finished grade. Tar at a temperature of 150 deg. F. was applied at the rate of one-third gallon per square yard by a distributor at a pressure of slightly over 30 pounds per square inch. A mixer was then drawn by a five-ton



Contract 52. — Foundation Grading in Preparation for Construction of Main Dam Embankment by Hydraulic Sluicing.

Quabbin Park Cemetery. — Looking Northwest Along Oak Way.

truck through the tar-treated gravel about three times or until the material was uniformly coated with tar. The mixer consisted of a series of steel bands twisted to a spiral shape and mounted on a steel frame 8 feet wide on steel runners. The effect was first to loosen the ground surface course and then to turn the mixture of tar and gravel about six times on each trip. A second application of tar was then made at the rate of one-third gallon per square yard, thoroughly mixed in place as before. The rate of application of tar was slightly increased in a few locations where the gravel contained fewer stones. The 2-inch surface course was then graded and rolled, care being taken not to cause cracking by excessive rolling. After 10 days to 2 weeks, a seal coat of tar was applied at the rate of one-third gallon per square yard covered with a sufficient layer of sand and dragged with a brush drag until the sand and tar were thoroughly mixed and uniformly distributed. Berm ditches were excavated where necessary to protect excavated slopes from erosion. Loam berms were constructed on the shoulders of fills in locations where excessive erosion might be expected. The slopes of all cuts and of some fills were loamed and seeded. Work was practically completed November 17.

The value of work included in contract estimates to November 16, the date of the latest estimate was $62,656.32, of which 85 per cent was included for payment. The contractor's office averaged 42 men for the period of 20 weeks ending October 24, after which time the force was greatly reduced. The maximum was 71 men for the week ending August 29.

The principal items of plant were as follows:

2 1¼-cu. yd. shovels, gasoline and air driven
2 Bulldozers
1 Air compressor, 210 cu. ft. per min. capacity
1 12-ton road roller
1 Road grader
5 5-ton trucks (average)
Miscellaneous portable concreting plant and pumps

The total work done and materials furnished to date under the principal items of Contract 54 are as follows:

Roadway earth excavation	27,070 cu. yds.
Ledge excavation	1,445 " "
Ordinary borrow	23,045 " "
Plain cement concrete masonry (1–2½–5)	90 " "
Reinforced cement concrete masonry (1–2–4)	65 " "
Bituminous material	31,050 gals.
Gravel borrow	16,615 cu. yds.
Sand borrow	345 " "
Fine grading, rolling and finishing	72,680 " "
Reinforcement for cement concrete structures	52,835 lbs.
Cable guard rail	6,915 lin. ft.
Trench excavation	1,545 cu. yds.
Clearing and grubbing	15.4 acres
Loam borrow	4,580 cu. yds.
Seeding and grassing	4.1 acres
Gravel mixed in place, surface course	1,540 cu. yds.
Plain cement concrete masonry for bridges (Class C)	270 " "
Reinforced cement concrete masonry for bridges (Class B)	325 " "

Contract 55. — Bids were opened May 21, for the construction of 4.34 miles of state highway in the Town of Petersham. Six bids were received, ranging from $251,955.25 to $307,315.00. The contract was executed June 23 with Arute Bros., Inc., Bridgewater, Mass., the low bidder.

This contract includes the portion in Worcester County of a new state highway located northerly of the reservoir site and connecting Petersham on the east with the Daniel Shays Highway on the west. This highway is 30 feet wide and consists of a bituminous macadam surface course 24 feet wide and 2½ inches thick on a broken stone base course 4 inches thick, placed on a sub-base of gravel 12 inches thick. The surface course was treated with asphalt applied at 350 deg. F. at a pressure of about 50 pounds per square inch and a total rate of 2⅜ gallons per square yard of surface. Standard methods of constructing this surface, described in previous reports, were used throughout. Three-foot gravel shoulders were constructed adjacent to the surface. Peat was excavated and replaced with suitable material where necessary, a maximum depth of 10 feet being encountered. One reinforced concrete culvert 8 feet by 6 feet was constructed at the crossing of the east branch of Fever Brook. Berm ditches were excavated where necessary to protect excavated slopes from erosion. Loam berms were constructed and seeded on the shoulders in locations where excessive erosion might be expected. Stone paving, riprap and cobble gutters treated with asphalt were constructed where needed. A few stonefill drains were placed in excavated slopes where ground water might be expected to cause slides. The slopes of all cuts and of some fills were loamed and seeded at the end of the year. The work was practically completed, except for a portion of the cable guard rail.

The value of work included in contract estimates to November 15, the date of the latest estimate, was $208,242.59, of which $99,172.50, covering mainly surfacing items and guard rail, was assumed by the Department of Public Works and the remainder, $109,070.09, by the Commission. Eighty-five per cent of the estimate was approved for payment. The contractor's force averaged 75 men for a period of 23 weeks ending November 30, the maximum being 144 for the week ending August 22.

The principal items of plant were as follows:

2 1¾-cu. yd. shovels, Diesel driven
3 1½-cu. yd. shovels, gasoline driven
1 ⅝-cu. yd. excavator
6 Bulldozers
3 Air compressors, total capacity 330 cu. ft. per min.
1 Power grader
1 Truck crane, ⅝-cu. yd. clamshell
4 12-ton road rollers
12 Trucks (average)
Miscellaneous portable concreting plant.

The total work done and materials furnished to date under the principal items of Contract 55 are as follows:

Roadway earth excavation	73,000 cu. yds.
Ledge excavation	5,800 " "
Ordinary borrow	60,000 " "
Plain cement concrete masonry (1–2½–5)	155 " "
Reinforced cement concrete masonry (1–2–4)	80 " "
Broken stone	26,050 " "
Bituminous material	142,100 gals.
Gravel borrow	30,500 cu. yds.
Sand borrow	1,700 " "
Fine grading	128,000 " "
Reinforcement for cement concrete structures	3,950 lbs.
Highway guard rail	12,370 lin. ft.
Trench excavation	4,400 cu. yds.
Clearing and grubbing	35 acres
Loam borrow	9,000 cu. yds.
Seeding and grassing	13 acres
Peat excavation	7,500 cu. yds.

Contract 57. — Bids were opened July 2, for the construction of 3.65 miles of state highway in the Town of New Salem. Six bids were received, ranging from $161,109.50 to $188,359.00. The contract was executed September 1 with John Iafolla Construction Co., Dedham, Mass., the low bidder.

This contract is for the westerly portion, in Franklin County, of the state highway northerly of the reservoir site, extending from Petersham to the Daniel Shays Highway. This is an extension of the highway in Worcester County constructed under Contract 55. Alternate bids were submitted on two types of surfacing, bituminous macadam and penolithic. The lowest bid was for penolithic surfacing, and in compliance with the request of the Department of Public Works this bid was accepted. With the exception of the surfacing, the same specifications apply as in the case of Contract 55, previously described.

Clearing and grubbing were begun September 1 and have been completed. Excavation is practically completed and the work on grading and drainage is in progress. At one point peat was excavated to a maximum depth of 11 feet. Two reinforced concrete culverts were constructed, the larger being 8 feet by 6 feet on the outlet from Hacker Pond.

The value of work included in contract estimates to November 27, the date of the latest estimate, was $32,130.20, of which 85 per cent was approved for payment. The contractor's force averaged 36 men for 13 weeks ending November 30, the maximum being 49 for the weeks ending October 10 and October 31.

The principal items of plant were as follows:

3 1¼-cu. yd. shovels
1 Truck crane, 1¼-cu. yd. clamshell
3 Bulldozers
3 14-ton road rollers, gasoline driven
3 Air compressors, total capacity 470 cu. ft. per min.
2 Power graders
6 Trucks (average)
Miscellaneous portable concreting plant and pumps

The total work done and materials furnished to date under the principal items of Contract 57 are as follows:

Roadway earth excavation	52,000 cu. yds.
Ledge excavation	2,500 " "
Ordinary borrow	5,500 " "
Plain cement concrete masonry (1–2½–5)	8 " "
Reinforced cement concrete masonry (1–2–4)	90 " "
Reinforcement for cement concrete structures	5,300 " "
Clearing and grubbing	27.5 acres
Peat excavation	8,500 cu. yds.

LIST OF DRAWINGS AND TABLES APPENDED HERETO

Location of Real Estate Acquired for Quabbin Reservoir.
Takings of Real Estate and Water Rights.
Status of Contracts Completed between November 30, 1935, and November 30, 1936; and in force on November 30, 1936.
Canvass of Bids; Contract 51.
Canvass of Bids; Contract 52.
Canvass of Bids; Contract 54.
Canvass of Bids; Contract 55.
Canvass of Bids: Contract 57.
Hydrograph of the Great Flood of March, 1936, on the Ware and Swift rivers.
Monthly Rainfall at Stations on Ware and Swift watersheds, 1936.

For data on contracts completed prior to November 30, 1935, see sixth to tenth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1936, see 1935 annual report.

Respectfully submitted,
FRANK E. WINSOR, *Chief Engineer.*

20 SOMERSET STREET, BOSTON, MASS.
January 2, 1937.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION

New accounts have been opened during the year necessitating transfers from old accounts.

GENERAL OVERHEAD

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
ADMINISTRATION, *Commissioners' Office:*		
Salaries, Commissioners	$10,499.99	$106,915.56
Salaries, Clerical	15,735.68	112,349.89
General Legal Expense	666.36	2,169.16
Furniture and Fixtures	1,470.82	4,397.04
Engineering Instruments	98.00	98.00
Rent and Upkeep	2,391.04	22,882.83
Automobile Purchase	0.00	2,464.90
Automobile Maintenance	290.95	3,020.66
Miscellaneous Expense (undistributed)	1,972.68	15,045.95
Advertising	1,598.15	9,592.50
Printing and Blueprinting	610.81	9,742.19
Stationery and Office Supplies	516.97	2,602.12
Postage	336.75	1,466.05
Total Administration, Commissioners' Office	$36,188.20	$292,746.85
ENGINEERING, *Headquarters' Office:*		
Salaries, Engineering	$85,955.62	$786,396.86
Salaries, Clerical	10,670.16	94,265.49
General Consultant Expense	0.00	116,515.25
General Legal Expense	0.00	53,160.29
Furniture and Fixtures	968.65	15,062.94
Laboratory Equipment	0.00	1,961.00
Laboratory Supplies	0.00	2,071.94
Rental of Equipment	0.00	3,370.02
Engineering Instruments	0.00	1,084.06
Rent and Upkeep of Boston Office	11,222.35	104,925.82
Rent and Upkeep of Springfield Laboratory	0.00	3,950.54
Automobile Purchase	0.00	3,151.60
Automobile Maintenance	287.42	3,905.41
Special Experiments	0.00	2,304.63
Miscellaneous Expense (undistributed)	1,248.68	21,917.55
Printing and Blueprinting	914.20	14,852.30
Stationery and Office Supplies	747.11	5,822.33
Postage	271.90	2,080.48
Total Engineering, Headquarters' Office	$112,386.57	$1,236,898.99
UNASSIGNED:		
Unassigned Supplies and Equipment	$-535.81	$421.15
Total Unassigned	$-535.81	$421.15
Total General Overhead	$148,038.96	$1,530,066.99

DISTRIBUTION OF GENERAL OVERHEAD

	Year ending Nov. 30 1936	Total to Nov. 30, 1936
ADMINISTRATION, *Commissioners' Office*:		
Wachusett-Coldbrook Tunnel	$1,095.10	$77,175.22
Coldbrook-Swift Tunnel	1,205.59	29,167.37
Quabbin Reservoir	15,647.61	111,097.81
Main Dam	13,049.99	36,725.88
Beaver Brook Dike	2,456.47	27,156.85
Southern Sudbury Emergency Supply	0.00	8,690.28
Metropolitan System — General (Expenditures under Chapter No. 48)	1,224.66	1,224.66
Cochituate Supply (Expenditures under Chapter No. 18)	1,508.78	1,508.78
Total Administration, Commissioners' Office	$36,188.20	$292,746.85
ENGINEERING, *Headquarters' Office:*		
Wachusett-Coldbrook Tunnel	$3,855.15	$309,782.61
Coldbrook-Swift Tunnel	3,934.40	111,977.84
Quabbin Reservoir	48,243.43	544,958.98
Main Dam	41,527.75	129,060.86
Beaver Brook Dike	7,534.14	100,419.03
Southern Sudbury Emergency Supply	0.00	33,407.97
Metropolitan System — General (Expenditures under Chapter No. 48)	3,233.45	3,233.45
Cochituate Supply (Expenditures under Chapter No. 18)	4,058.25	4,058.25
Total Engineering, Headquarters' Office	$112,386.57	$1,236,898.99

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT, WARE SUPPLY

	Year ending Nov. 30 1936	Total to Nov. 30, 1936
GENERAL OVERHEAD:		
Administration	$1,095.10	$77,175.22
Engineering	3,855.15	309,782.61
Total General Overhead	$4,950.25	$386,957.83
ENGINEERING:		
Salaries, Engineering and Clerical	$2,379.35	$396,752.85
Consultant Expense	0.00	7,649.86
Labor	1,859.50	3,874.83
Furniture and Fixtures	62.92	2,303.81
Engineering Instruments	23.75	7,579.22
Rent and Upkeep	947.69	17,752.05
Automobile Purchase	0.00	11,422.82
Automobile Maintenance	251.71	15,430.61
Contracts for Investigations and Surveys	0.00	18,640.69
Miscellaneous Expense (undistributed)	368.66	9,565.47
Advertising	0.00	6.05
Printing and Blueprinting	41.37	1,100.30
Stationery and Office Supplies	61.48	3,027.41
Postage	9.26	444.07
Total Engineering	$6,005.69	$495,555.14
REAL ESTATE — *General Construction:*		
Legal and Expert Expense	$0.00	$6,186.92
Consultant Expense	0.00	455.66
Labor	0.00	1,711.20
Miscellaneous Expense (undistributed)	0.00	1,003.60

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Printing and Blueprinting	$1.44	$62.36
Purchases and Settlements	158.34	123,147.50
Taxes	188.21	3,682.24
Maintenance of Real Estate	190.21	1,298.18
Police Protection, Labor	0.00	41.00
Fire Protection, Equipment	1,223.69	1,254.66
Miscellaneous Expense	0.00	0.54
Special Agents, Salaries	0.00	12,949.00
Furniture and Fixtures	0.00	117.67
Automobile Purchase	0.00	1,222.50
Automobile Maintenance	0.00	2,124.30
Miscellaneous Expense (undistributed)	0.00	1,201.73
Printing and Blueprinting	0.00	26.51
Stationery and Office Supplies	0.00	5.48
Postage	0.00	21.36
Total Real Estate	$1,761.89	$156,512.41
Ware Watershed Protection:		
Salaries, Engineering and Clerical	$12,670.93	$124,836.72
Legal and Expert Expense	5,210.34	21,448.47
Consultant Expense	0.00	763.70
Labor	2,605.94	12,128.18
Engineering Instruments	60.97	378.11
Furniture and Fixtures	62.92	62.92
Completed Contract No. 27	0.00	4,395.51
Completed Contract No. 39	0.00	238,708.67
Automobile Purchase	578.00	1,146.45
Automobile Maintenance	928.43	4,631.16
Special Experiments	0.00	700.00
Miscellaneous Expense (undistributed)	750.24	5,449.25
Printing and Blueprinting	154.35	624.56
Stationery and Office Supplies	184.82	282.76
Advertising	0.00	2.00
Postage	15.00	31.85
Installed Equipment	0.00	5,610.75
Purchases and Settlements	122,071.63	1,204,816.82
Taxes	7,140.44	35,225.85
Maintenance of Real Estate	2,982.38	4,736.20
Purchase and Planting of Trees and Shrubbery	720.00	720.00
Special Agents, Salaries	2,460.00	7,188.67
Rent and Upkeep	165.33	214.19
Automobile Purchase	0.00	303.35
Automobile Maintenance	489.60	1,455.84
Miscellaneous Expense (undistributed)	289.19	838.70
Printing and Blueprinting	53.63	56.82
Stationery and Office Supplies	2.00	3.91
Postage	7.05	20.55
Police Protection, Labor	10.00	10.00
Fire Protection, Equipment	39.09	39.09
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing		
State Sanatorium Branch	72.54	422.15
U. S. Vet. Hospital Branch	83.31	450.94
Trunk Sewer, except Branches	244.34	1,077.92
Use of City of Worcester's Sewerage System for Disposal of Sewage from Rutland-Holden Sewer	15,78	15.78
Total Ware Watershed Protection	$160,068.25	$1,678,797.84

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Ware Diversion Damages — Except Jury Trial:		
Salaries, Engineering and Clerical	$4,623.60	$86,783.99
Legal and Expert Expense	0.00	3,171.83
Consultant Expense	470.53	24,458.98
Labor	60.29	2,370.98
Furniture and Fixtures	5.35	29.76
Laboratory Equipment	86.86	273.21
Laboratory Supplies	89.77	376.71
Engineering Instruments	2.40	560.34
Rental of Equipment	0.00	203.75
Rent and Upkeep	4.62	4.75
Automobile Purchase	0.00	170.42
Automobile Maintenance	544.74	3,970.13
Contracts for Investigations and Surveys	0.00	63.27
Materials of Construction	0.00	136.51
Miscellaneous Expense (undistributed)	80.71	7,336.39
Printing and Blueprinting	24.85	1,257.19
Stationery and Office Supplies	4.93	64.05
Postage	0.00	6.62
Purchases and Settlements	0.00	166,525.00
Sub Total Ware Diversion Damages — Except Jury Trial	$5,998.65	$297,763.88
Ware Diversion Damages — Jury Trial:		
Salaries, Engineering and Clerical	$14,379.41	$55,904.01
Legal Expense	41,440.95	57,558.42
Consultant Expense	40,866.47	76,851.99
Expert and other Witness Expense	3,591.15	14,133.12
Automobile Maintenance	368.47	440.58
Miscellaneous Expense (undistributed)	4,180.74	6,577.48
Printing and Blueprinting	355.88	604.07
Stationery and Office Supplies	125.00	125.00
Postage	15.53	15.53
Settlements	0.00	260,000.00
Payments under Certificates of Judgment	317,231.17	507,440.12
Sub Total Ware Diversion Damages — Jury Trial	$422,554.77	$979,650.32
Total Ware Diversion Damages	$428,553.42	$1,277,414.20
Permanent Contruction — Construction Contracts:	$0.00	$9,629,739.99
Permanent Construction — Except Construction Contracts:		
Installed Equipment	$–19.27	$58,998.83
Temporary Equipment	0.00	6,423.60
Labor	166.00	4,226.44
Contracts for Equipment for Surveys	0.00	898.34
Maintenance of Partially Completed Structures	888.57	9,854.81
Maintenance of Grounds	1,293.33	4,932.19
Purchases of Plants, Trees and Shrubbery	0.00	842.58
Rental of Equipment	0.00	7.00
Miscellaneous Expense	0.00	9,453.84
Materials of Construction	25.87	25.87
Total	$2,354.50	$95,663.50
Total Wachusett-Coldbrook Tunnel, Ware Supply	$603,694.00	$13,720,640.91
Special Investigation — Pollution of Ware and Quinapoxet Watersheds (Expenditures under Chapter 66, Resolves of 1931)		
Total Special Investigation	$0.00	$1,995.99

Wachusett Watershed Protection

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Engineering:		
Salaries, Engineering and Clerical	$1,862.50	$4,006.07
Legal Expense	0.00	3.55
Labor	407.80	435.00
Automobile Maintenance	97.90	145.23
Miscellaneous Expense (undistributed)	43.46	259.49
Printing and Blueprinting	13.41	19.91
Postage	3.85	3.85
Total Wachusett Watershed Protection	$2,433.92	$4,873.10

Coldbrook-Swift Tunnel Section of Quabbin Aqueduct

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
General Overhead:		
Administration	$1,205.59	$29,167.37
Engineering	3,934.40	111,977.84
Total General Overhead	$5,139.99	$141,145.21
Engineering:		
Salaries, Engineering and Clerical	$9,415.73	$259,722.48
Consultant Expense	140.23	552.98
Labor	1,194.15	2,006.40
Furniture and Fixtures	533.99	1,554.90
Engineering Instruments	10.17	4,561.46
Rent and Upkeep	157.63	10,426.61
Rental of Equipment	0.00	3.00
Automobile Purchase	0.00	8,010.52
Automobile Maintenance	470.87	17,797.36
Contracts for Investigations and Surveys	0.00	13,525.66
Materials of Construction	0.00	2.25
Miscellaneous Expense (undistributed)	310.79	7,955.78
Printing and Blueprinting	43.98	953.55
Stationery and Office Supplies	56.16	2,151.70
Postage	10.15	515.44
Total Engineering	$12,343.85	$329,740.09
Real Estate:		
Legal and Expert Expense	$3.89	$3,103.53
Labor	0.00	12.20
Miscellaneous Expense (undistributed)	0.00	27.16
Printing and Blueprinting	0.00	34.87
Postage	0.00	5.68
Purchases and Settlements	1,025.00	23,610.00
Taxes	0.00	724.77
Maintenance of Real Estate	227.94	252.79
Fire Protection, Equipment	0.00	60.86
Total Real Estate	$1,256.83	$27,831.86
Permanent Construction — Construction Contracts:		
Completed Contract No. 20	$0.00	$4,809,852.83
Contract No. 53, Construction of Head House at Shaft 9	7,030.80	7,030.80
Total Contracts	$7,030.80	$4,816,883.63

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
PERMANENT CONSTRUCTION — EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$0.00	$308.95
Installed Equipment	0.00	489.34
Water Supply System	195.32	3,417.56
Miscellaneous Expense	38.77	2,526.20
Total	$234.09	$6,742.05
Total Coldbrook-Swift Tunnel	$26,005.56	$5,322,342.84
QUABBIN RESERVOIR EXCEPT MAIN DAM AND DIKE		
GENERAL OVERHEAD:		
Administration	$15,647.61	$111,097.81
Engineering	48,243.43	544,958.98
Total General Overhead	$63,891.04	$656,056.79
ENGINEERING:		
Salaries, Engineering and Clerical	$53,987.93	$420,331.19
Consultant Expense	589.52	817.75
Labor	5,885.90	16,870.04
Furniture and Fixtures	104.22	3,171.10
Laboratory Equipment	867.22	2,245.46
Laboratory Supplies	896.09	3,623.81
Rental of Equipment	0.00	16.75
Engineering Instruments	185.44	6,529.90
Rent and Upkeep	2,281.34	10,576.99
Automobile Purchase	3,511.49	20,677.34
Automobile Maintenance	3,584.04	18,858.00
Special Experiments	0.00	422.80
Contracts for Investigations and Surveys	1,937.24	14,683.87
Office Buildings	6.04	5,059.20
Miscellaneous Expense (undistributed)	1,132.24	6,752.95
Printing and Blueprinting	480.27	2,533.14
Stationery and Office Supplies	976.99	6,508.86
Postage	334.59	1,426.23
Total Engineering	$76,760.56	$541,105.38
REAL ESTATE — EXCEPT BOARD OF REFEREES AND JURY TRIAL:		
Legal and Expert Expense	$8,962.29	$161,930.66
Consultant Expense	0.00	146.78
Labor	7,000.97	7,342.12
Furniture and Fixtures	30.38	46.06
Automobile Maintenance	92.02	106.44
Miscellaneous Expense (undistributed)	1,091.19	8,136.85
Advertising	0.00	208.66
Printing and Blueprinting	34.02	1,350.48
Stationery and Office Supplies	0.00	0.45
Purchases and Settlements	254,830.66	6,431,829.18
Purchase price, B. & A. R.R. and N. Y. C. lessee, for part of Athol Branch and general release of all claims for damages for reservoir construction	0.00*	575,000.00
Taxes	50,447.24	341,915.82
Maintenance of Real Estate	1,825.45	8,362.38
Water Supply System	0.00	40.60
Fire Protection, Equipment	49.30	4,839.60
Automobile Purchase	0.00	771.69
Automobile Maintenance	13.46	293.79

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* This item taken out of 1936 expenditures and put into 1935 in accordance with instructions from Comptroller's Bureau 12–9–36. Does not alter total to date.

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Labor	$625.23	$1,035.93
Miscellaneous Expense	50.36	221.38
Police Protection, Labor	180.00	194.00
Special Agents, Salaries	2,460.00	20,486.00
Equipment	0.00	118.33
Automobile Purchase	0.00	1,540.31
Automobile Maintenance	439.70	3,493.00
Miscellaneous Expense (undistributed)	187.29	1,434.32
Printing and Blueprinting	0.00	52.72
Stationery and Office Supplies	3.27	13.68
Postage	0.00	17.07
Renting Agents, Salaries	2,820.00	23,708.10
Legal Expense	60.00	120.00
Furniture and Fixtures	0.00	29.29
Automobile Purchase	524.95	524.95
Automobile Maintenance	116.80	116.80
Labor	21.50	21.50
Miscellaneous Expense (undistributed)	277.98	889.01
Printing and Blueprinting	0.00	18.62
Stationery and Office Supplies	2.00	37.16
Postage	55.20	184.79
Payments to Towns	3,000.00	17,500.00
Sub Total Real Estate — Except Board of Referees and Jury Trial	$335,201.26	$7,614,078.52
REAL ESTATE — BOARD OF REFEREES:		
Salaries of Referees	$0.00	$6,940.00
Salaries, Engineering and Clerical	0.00	967.88
Legal Expense	0.00	4,823.53
Consultant Expense	0.00	622.40
Expert and other Witness Expense	0.00	4,510.07
Expenses of Board of Referees	0.00	550.30
Miscellaneous Expense	0.00	45.78
Sub Total Real Estate — Board of Referees	$0.00	$18,459.96
REAL ESTATE — JURY TRIAL:		
Salaries, Engineering and Clerical	$0.00	$27.73
Legal Expense	86.72	557.90
Miscellaneous Expense	0.00	2.00
Payments under Certificates of Judgment	80.79	7,832.66
Sub Total Real Estate — Jury Trial	$167.51	$8,420.29
Total Real Estate	$335,368.77	$7,640,958.77
QUABBIN RESERVOIR DAMAGES:		
Salaries, Engineering	$0.00	$48.68
Legal and Expert Expense	0.00	931.00
Board of Referees	0.00	0.00
Consultant Expense	0.00	2,158.82
Miscellaneous Expense (undistributed)	0.00	15.19
Printing and Blueprinting	0.00	2.96
Purchases and Settlements	2,600.00	48,275.00
Total Quabbin Reservoir Damages	$2,600.00	$51,431.65

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
SWIFT DIVERSION DAMAGES — EXCEPT JURY TRIAL:		
Salaries, Engineering and Clerical	$9,848.23	$78,250.54
Legal and Expert Expense	160.00	5,806.52
Consultant Expense	383.39	70,237.56
Labor	542.66	963.85
Furniture and Fixtures	29.75	69.47
Laboratory Equipment	780.38	2,072.94
Laboratory Supplies	805.29	3,153.01
Engineering Instruments	21.53	762.98
Rent and Upkeep	41.50	42.65
Rental of Equipment	0.00	10.50
Automobile Purchase	0.00	1,533.72
Automobile Maintenance	340.24	3,494.26
Contracts for Investigations and Surveys	0.00	569.47
Materials of Construction	0.00	18.99
Miscellaneous Expense (undistributed)	97.90	6,155.27
Printing and Blueprinting	80.82	1,054.07
Stationery and Office Supplies	44.25	85.26
Purchases and Settlements	0.00	942,975.00
Sub Total Swift Diversion Damages — Except Jury Trial	$13,175.94	$1,117,256.06
SWIFT DIVERSION DAMAGES — JURY TRIAL:		
Salaries, Engineering and Clerical	$407.50	$407.50
Legal and Expert Expense	9,653.27	9,653.27
Consultant Expense	2,815.05	2,815.05
Automobile Maintenance	104.94	104.94
Miscellaneous Expense (undistributed)	328.48	328.48
Printing and Blueprinting	22.18	22.18
Stationery and Office Supplies	19.55	19.55
Postage	1.00	1.00
Payments under Certificates of Judgment	9,985.53	9,985.53
Sub Total Swift Diversion Damages — Jury Trial	$23,337.50	$23,337.50
Total Swift Diversion Damages	$36,513.44	$1,140,593.56
QUABBIN RESERVOIR — CEMETERIES		
QUABBIN PARK CEMETERY CONSTRUCTION:		
Salaries, Engineering and Clerical	$384.25	$11,948.52
Legal and Expert Expense	0.00	65.00
Consultant Expense	0.00	125.00
(Construction) Labor	4,359.59	17,769.34
Tools and Equipment	273.47	367.46
Automobile Purchase	0.00	1,615.37
Automobile Maintenance	441.99	1,717.17
Rental of Equipment	0.00	33.19
Purchases and Settlements	0.00	8,850.00
Construction Materials	25.44	1,670.20
Purchase and Planting of Trees and Shrubbery	0.00	218.93
Receiving Vault	0.00	2,768.85
Water Supply System	0.00	1,251.97
Maintenance of Grounds	2,097.87	6,854.16
Miscellaneous Expense (undistributed)	57.78	233.43
Printing and Blueprinting	0.12	159.20
Stationery and Office Supplies	0.00	10.05
Completed Contract No. 34	0.00	7,842.94
Sub Total Quabbin Park Cemetery Construction	$7,640.51	$63,500.78

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:		
Salaries, Engineering and Clerical	$2,405.25	$9,344.34
Tools and Equipment	28.42	466.80
Automobile Purchase	0.00	2,669.99
Automobile Maintenance	362.54	1,462.43
Removal and Reinterment of Bodies	3,368.59	13,557.12
Removal and Resetting of Monuments	1,944.40	8,667.38
Miscellaneous Expense	4.75	6.75
Rental of Equipment	0.00	10.50
Sub Total Removals to Quabbin Park Cemetery	$8,113.95	$36,185.31
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUABBIN PARK:		
Salaries, Engineering and Clerical	$206.50	$6,062.99
Automobile Purchase	0.00	380.00
Automobile Maintenance	17.48	107.54
Purchases and Settlements	245.00	7,204.10
Perpetual Care Fund Contributions	0.00	175.00
Removal and Reinterment of Bodies	157.91	6,625.36
Removal and Resetting of Monuments	152.35	5,869.69
Miscellaneous Expense	0.00	123.51
Sub Total Removals to Other Cemeteries	$779.24	$26,548.19
Total Quabbin Reservoir Cemeteries	$16,533.70	$126,234.28
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:		
Contract No. 47, Construction of Service Building and Head House at Shaft 12	$24,405.52	$24,405.52
Contract No. 49, Excavation of Diversion Channels	69,719.69	76,289.69
Contract No. 51, Construction of East Branch Baffle	147,970.36	147,970.36
Total Contracts	$242,095.57	$248,665.57
PERMANENT CONSTRUCTION — EXCEPT CONSTRUCTION CONTRACTS:		
Installed Equipment	$0.00	$214.78
Labor	361.00	361.00
Automobile Maintenance	1.20	1.20
Miscellaneous Expense (undistributed)	61.75	61.75
Printing and Blueprinting	24.28	24.28
QUABBIN RESERVOIR CLEARING		
Tools and Equipment	$22,182.06	$22,468.18
Labor	1,594,901.28	1,595,472.28
Payments for Compensation	7,133.70	7,133.70
Miscellaneous Expense (undistributed)	2,411.88	2,414.93
Printing and Blueprinting	69.76	69.76
Stationery and Office Supplies	994.63	994.63
Postage	175.71	175.71
Automobile Purchase	12,041.97	12,041.97
Automobile Maintenance	3,858.64	3,904.73
Furniture and Fixtures	877.65	877.65
Rent and Upkeep	685.33	685.33
Medical and Surgical Equipment	124.82	124.82

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Medical Supplies	$1,809.72	$1,809.72
Medical Services	2,945.41	2,945.41
Fire Protection, Equipment	425.87	425.87
Miscellaneous	128.60	128.60
Labor	2,241.50	2,241.50
Legal Expense	415.00	415.00
Total Quabbin Reservoir Construction, except Construction Contracts	$1,653,871.76	$1,654,992.80
HIGHWAY AND PUBLIC UTILITY RELOCATION:		
Salaries, Engineering and Clerical	$37,667.91	$195,671.44
Legal and Expert Expense	0.00	49.10
Consultant Expense	0.00	8,454.75
Labor	1,985.10	7,993.51
Furniture and Fixtures	0.00	61.74
Completed Contracts Nos. 21, 40, 41 and 44	0.00	551,578.91
Completed Contract No. 43	–8,221.94	267,037.58
Contract No. 54, Construction of a Highway in the Towns of Dana and Petersham	53,257.87	53,257.87
Contract No. 55, Construction of a Portion of the Petersham-New Salem Highway in the County of Worcester	92,709.57	92,709.57
Contract No. 57, Construction of a Portion of the Petersham-New Salem Highway in the County of Franklin	27,310.67	27,310.67
Installed Equipment	0.00	811.57
Temporary Equipment	0.00	149.50
Engineering Instruments	323.61	948.75
Automobile Purchase	0.00	535.00
Automobile Maintenance	901.45	5,384.31
Miscellaneous Expense (undistributed)	1,187.64	5,827.57
Printing and Blueprinting	382.69	675.18
Stationery and Office Supplies	68.79	159.13
Maintenance of Real Estate	0.00	551.60
Total Highway and Public Utility Relocation	$207,573.36	$1,219,167.75
QUABBIN RESERVOIR WATERSHED PROTECTION REFORESTATION:		
Nurseries; Salaries, Engineering	$1,033.00	$1,177.15
Labor	9,855.98	11,870.33
Tools and Equipment	2,507.68	2,569.74
Automobile Purchase	398.50	398.50
Automobile Maintenance	218.07	254.05
Nursery Supplies	4,969.41	4,969.41
Miscellaneous Expense	104.63	113.13
Watershed; Salaries, Engineering	157.00	437.76
Labor	2,309.20	7,800.10
Tools and Equipment	19.18	184.81
Automobile Maintenance	62.29	71.51
Nursery Supplies	1,347.00	1,347.00
Miscellaneous Expense	2.84	63.85
Sub Total Reforestation	$22,984.78	$31,257.34
Total Quabbin Reservoir Watershed Protection	$22,984.78	$31,257.34
Total Quabbin Reservoir, Except Main Dam and Dike	$2,658,192.98	$13,310,463.89

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
QUABBIN RESERVOIR MAIN DAM		
GENERAL OVERHEAD:		
Administration	$13,049.99	$36,725.88
Engineering	41,527.75	129,060.86
Total General Overhead	$54,577.74	$165,786.74
ENGINEERING:		
Salaries, Engineering and Clerical	$54,376.62	$172,331.63
Consultant Expense	564.28	5,718.54
Labor	4,283.30	15,116.93
Furniture and Fixtures	79.57	210.51
Laboratory Equipment	0.00	453.77
Rental of Equipment	0.00	1,202.25
Engineering Instruments	214.05	630.54
Rent and Upkeep	351.01	1,054.25
Automobile Purchase	0.00	1,495.00
Automobile Maintenance	1,100.27	4,106.27
Contracts for Investigations and Surveys	3,274.60	61,895.52
Office Buildings	0.00	578.39
Special Experiments	189.90	1,790.79
Water Supply System	0.00	20.00
Miscellaneous Expense (undistributed)	644.67	12,070.15
Printing and Blueprinting	1,028.92	1,727.03
Stationery and Office Supplies	349.82	960.26
Postage	44.09	96.57
Total Engineering	$66,501.10	$281,458.40
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 30, 32 and 36	$0.00	$804,913.52
Contract No. 38, Constructing a Core Wall to Sound Rock at Main Dam	566,351.61	1,485,997.71
Contract No. 52, Constructing Embankment at Main Dam	54,305.10	54,305.10
Total Contracts	$620,656.71	$2,345,216.33
PERMANENT CONSTRUCTION — EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$120.00	$3,573.70
Installed Equipment	0.00	3,253.00
Temporary Equipment	0.00	4,213.39
Miscellaneous Expense	391.19	12,489.69
Total	$511.19	$23,529.78
Total Quabbin Reservoir Main Dam	$742,246.74	$2,815,991.25
QUABBIN RESERVOIR BEAVER BROOK DIKE		
GENERAL OVERHEAD:		
Administration	$2,456.47	$27,156.85
Engineering	7,534.14	100,419.03
Total General Overhead	$9,990.61	$127,575.88

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
ENGINEERING:		
Salaries, Engineering and Clerical	$32,792.63	$133,670.59
Consultant Expense	564.27	5,505.11
Labor	15,078.40	23,264.64
Furniture and Fixtures	18.50	145.72
Laboratory Equipment	0.00	315.73
Rental of Equipment	0.00	921.50
Engineering Instruments	38.76	155.65
Rent and Upkeep	0.00	16.00
Automobile Purchase	0.00	600.00
Automobile Maintenance	513.27	2,366.94
Contracts for Investigations and Surveys	692.59	24,773.32
Special Experiments	187.50	242.70
Miscellaneous Expense (undistributed)	111.92	4,872.48
Printing and Blueprinting	38.88	1,317.63
Stationery and Office Supplies	1.96	160.95
Advertising	0.00	79.34
Postage	0.30	0.30
Total Engineering	$50,038.98	$198,408.60
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 32 and 36	$0.00	$1,054,137.90
Contract No. 50, Constructing the Embankment of the Dike	737,605.13	1,098,183.83
Total Contracts	$737,605.13	$2,152,321.73
PERMANENT CONSTRUCTION — EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$0.00	$9,757.25
Temporary Equipment	0.00	1,993.18
Tools and Equipment	0.00	14.70
Miscellaneous Expense	28.79	1,677.32
Installed Equipment	235.00	235.00
Total	$263.79	$13,677.45
Total Quabbin Reservoir Beaver Brook Dike	$797,898.51	$2,491,983.66

COCHITUATE SUPPLY — SPECIAL INVESTIGATION RELATIVE TO SETTING OFF A PORTION OF LAKE COCHITUATE FOR BOATING AND FISHING

(Expenditures under Chapter 18, Resolves of 1936)

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
GENERAL OVERHEAD:		
Administration	$1,508.78	$1,508.78
Engineering	4,058.25	4,058.25
Total General Overhead	$5,567.03	$5,567.03
ENGINEERING:		
Salaries, Engineering and Clerical	$5,845.37	$5,845.37
Labor	200.50	200.50
Automobile Maintenance	47.85	47.85
Miscellaneous Expense (undistributed)	406.04	406.04
Printing and Blueprinting	52.94	52.94
Stationery and Office Supplies	15.08	15.08
Laboratory Supplies	65.00	65.00
Total Engineering	$6,632.78	$6,632.78
Total Cochituate Supply	$12,199.81	$12,199.81

METROPOLITAN SYSTEM — GENERAL — INVESTIGATION RELATIVE TO IMPROVING DISTRIBUTION SYSTEM AND PREVENTING POLLUTION OF SOURCES OF SUPPLY OF METROPOLITAN WATER DISTRICT

(Expenditures under Chapter 48, Resolves of 1936)

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
GENERAL OVERHEAD:		
Administration	$1,224.66	$1,224.66
Engineering	3,233.45	3,233.45
Total General Overhead	$4,458.11	$4,458.11
ENGINEERING:		
Salaries, Enigneering and Clerical	$886.80	$886.80
Miscellaneous Expense	3.70	3.70
Total Engineering	$890.50	$890.50
Total Metropolitan System — General	$5,348.61	$5,348.61

SOUTHERN SUDBURY EMERGENCY SUPPLY

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
GENERAL OVERHEAD:	$0.00	$42,098.25
ENGINEERING:	0.00	44,235.07
REAL ESTATE:	0.00	30,553.18
SOUTHERN SUDBURY DIVERSION DAMAGES	0.00	50,752.66
PERMANENT CONSTRUCTION — CONSTURCTION CONTRACTS	0.00	458,957.30
PERMANENT CONSTRUCTION — EXCEPT CONSTRUCTION CONTRACTS	0.00	11,937.37
Total Southern Sudbury Emergency Supply	$0.00	$638,533.83

SUMMARY

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Wachusett-Coldbrook Tunnel, Ware Supply	$603,694.00	$13,720,640.91
Special Investigation — Pollution of Ware and Quinapoxet Watersheds	0.00	1,995.99
Wachusett Watershed Protection	2,433.92	4,873.10
Coldbrook-Swift Tunnel	26,005.56	5,322,342.84
Quabbin Reservoir Except Main Dam and Dike	2,658,192.98	13,310,463.89
Quabbin Reservoir Main Dam	742,246.74	2,815,991.25
Quabbin Reservoir Beaver Brook Dike	797,898.51	2,491,983.66
Southern Sudbury Emergency Supply	0.00	638,533.83
Cochituate Supply, Chapter 18	12,199.81	12,199.81
Metropolitan System, General, Chapter 48	5,348.61	5,348.61
Unassigned	–535.81	421.15
Grand Total	$4,847,484.32	$38,324,795.04

RECEIPTS FROM RENTS, SALES, ETC.

	Year ending Nov. 30, 1936	Total to Nov. 30, 1936
Sales	$78,217.17	$261,139.18
Rents	43,094.98	394,970.33
Miscellaneous	234.54	102,866.27
Total Receipts	$121,546.69	$758,975.78

FINANCIAL STATEMENT VERIFIED 3–2–37 (J.D.M)

Approved: GEO. E. MURPHY, *Comptroller.*

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

LOCATION OF REAL ESTATE ACQUIRED FOR THE QUABBIN RESERVOIR

(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL - NOV. 30, 1935.		TOTAL FOR YEAR ENDING NOV. 30, 1936 (ACRES)	TOTAL NOV. 30, 1936 (ACRES)	REMARKS
	1935 ANNUAL REPORT (ACRES)	REVISED - SEE NOTE (ACRES) *			
BELCHERTOWN	2,872	2,888	128	3,016	* *Revisions have been made using acreages obtained from surveys wherever available, otherwise from deeds, property blanks, etc.*
DANA	8,530	8,525	414	8,939	
ENFIELD	8,638	8,638	167	8,805	
GREENWICH	10,597	10,587	425	11,012	
HARDWICK	3,033	3,013	346	3,359	
NEW SALEM	9,586	9,586	642	10,228	
ORANGE	21	19	—	19	
PELHAM	4,720	4,720	235	4,955	
PETERSHAM	805	805	652	1,457	
PRESCOTT	10,507	10,507	71	10,578	
SHUTESBURY	3,106	3,106	765	3,871	
WARE	829	829	—	829	
WENDELL	260	260	87	347	
TOTALS	63,504	63,483	3,932	67,415	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

TAKINGS OF REAL ESTATE AND WATER RIGHTS

TAKING FOR	TAKING NO.	TOWN	COUNTY	DATE OF TAKING	PLAN NO.	TITLE VESTED IN COMMONWEALTH	
						FEE (Acres)	EASEMENT (Acres)
Southern Sudbury Emergency Supply.	1 to 9 incl.	Details previously reported in the 1930 Annual Report.			C-1 to C-15 incl.	258.81 (Also Water Rights)	29.02
Wachusett-Coldbrook Tunnel section of Quabbin Aqueduct.	1 to 4 incl.	Details previously reported in the 1930 Annual Report.			T-1 to T-13 incl.	570.22	20.37
Coldbrook-Swift Tunnel section of Quabbin Aqueduct.	1 to 3 incl.	Details previously reported in the 1931 Annual Report.			T-14 to T-27 incl.	*544.81	4.06
		*(391.42 acres of this total are within the Quabbin Reservoir Area)					
Quabbin Reservoir.	1 to 13 incl.	Details previously reported in the 1931, 1932, 1933, 1934 and 1935 Annual Reports.			S-1 to S-28 incl.	637.01 (Also Water Rights)	19.85
" "	14	Dana & Petersham	Worcester	May 7, 1936	S-29	19.24	.05
" "	15	Petersham	Worcester	May 21, 1936	S-30 to S-32 incl.	43.12	.19
" "	16	New Salem	Franklin	July 2, 1936	S-33 & S-34	35.85	
" "	17	Greenwich & Hardwick	Hampshire & Worcester	July 28, 1936	S-35	8.72	
						743.94	20.09
Ware River Supply and Watershed.	1 to 2 incl.	Details previously reported in the 1931, 1932 and 1933 Annual Reports.			W-1 and A-1 to A-14 incl.	0.25 (Also Water Rights)	22.94

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1935 AND NOV. 30, 1936

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
43	*Construction of Ext. of Belchertown-Pelham Highway to New Salem Center.*	*Shutesbury & New Salem.*	*Swift*	*V. Barletta Co.*	*Aug. 11, 1933*	7	*Aug. 22, 1933*	$300,397.50	$387,605.47 **	*June 30, 1936*

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1936

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
33	*Purchase of Power at Shaft 1.*	*West Boylston*	*Ware*	*New England Power Co.*	*Date of Agreement = Aug. 6, 1931.*			*Agreed Rates*	$ 2,079.63
38	*Core Wall to Bed Rock at Dam Site*	*Belchertown, Enfield & Ware*	*Swift*	*The Two Companies, Inc.*	*May 7, 1935*	9	*May 9, 1935*	$1,330,765.00	1,485,997.71
42	*Use of Worcester Sewerage System and Treatment Works a/c Rutland-Holden Sewer.*	*Worcester*	*Ware*	*City of Worcester*	*Date of Agreement = May 1, 1933.*			*Lump Sum = 325,000.00* *Annual Charge = **	325,000.00 15.78
46	*Connection with Rutland-Holden Sewer, & Disposal of Sewage from the U.S. Veterans Hospital.*	*Rutland* *(Note:- Payments under Contract 46 are RECEIVED by the M.D.W.S.C.*	*Ware*	*U.S. Veterans Administration.*	*Date of Agreement = Nov. 7, 1934*			*Lump Sum = 37,000.00* *Annual Charge = **	37,000.00 29.04
47	*Service Building & Head House at Shaft 12, of Quabbin Aqueduct.*	*Greenwich*	*Swift*	*Vincent Caira*	*April 17, 1936*	4	*April 21, 1936*	34,990.00	24,405.52
48	*Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium.*	*Rutland* *(Note:- Payments under Contract 48 are RECEIVED by the M.D.W.S.C.)*	*Ware*	*Rutland State Sanatorium.*	*Date of Agreement = June 5, 1934*			*Lump Sum = 60,000.00* *Contingent Charge = **	60,000.00 *None*
49	*Excavating Diversion Channels at the Site of Quabbin Reservoir.*	*Dana, Hardwick & Greenwich.*	*Swift*	*Cenedello & Co.*	*Sept. 10, 1935*	12	*Oct. 1, 1935*	79,050.00	76,289.69
50	*Dike Embankment - Quabbin Reservoir.*	*Enfield & Ware*	*Swift*	*The Arthur A. Johnson Corporation*	*Nov. 13, 1934*	6	*Nov. 26, 1934*	1,446,655.00	1,098,183.83
51	*East Branch Baffle of Quabbin Reservoir.*	*Greenwich & Hardwick*	*Swift*	*Franklin A. Snow Company*	*May 14, 1936*	8	*May 28, 1936*	219,075.00	147,970.36
52	*Main Dam Embankment - Quabbin Reservoir.*	*Belchertown, Enfield & Ware*	*Swift*	*Benjamin Foster Company*	*July 2, 1936*	9	*July 16, 1936*	2,317,445.00	54,305.10
53	*Head House at Shaft #9, Quabbin Aqueduct.*	*Barre*	*Swift*	*The English Construction Company*	*April 24, 1936*	2	*Apr. 30, 1936*	9,300.00	7,030.80
54	*Construction of Dana-Petersham Highway.*	*Dana & Petersham*	*Swift*	*Carlo Bianchi & Company Inc.*	*May 7, 1936*	14	*May 7, 1936*	68,040.00	53,257.87
55	*Portion of Petersham-New Salem Highway.*	*Petersham*	*Swift*	*Arute Bros., Inc.*	*May 21, 1936*	6	*June 7, 1936*	251,955.25	** 177,006.20
57	*Portion of Petersham-New Salem Highway.*	*New Salem*	*Swift*	*John Iafolla Construction Co.*	*July 2, 1936*	6	*July 2, 1936*	161,109.50	27,310.67

* *Proportion of Annual Maintenance Cost.*

** *Of these amounts the State Dept. of Public Works has paid $105,014.98 on Cont. 43, and $84,296.63 on Cont. 55, covering the surfacing and guard rail items on both contracts, also traffic signal duct items on Cont. 55.*

The above contracts were all awarded to the lowest bidder except Contract 43 which was awarded to the 2nd lowest bidder.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.

CONTRACT 51

FOR CONSTRUCTING THE EAST BRANCH BAFFLE AT THE SITE OF QUABBIN RESERVOIR IN THE TOWNS OF GREENWICH AND HARDWICK.

CANVASS OF BIDS CONTRACT 51 OPENED MAY 14, 1936.

				① Franklin A. Snow Co. 20 Providence St., Boston, Mass.		② John Iafalla Constr. Co. 11 Van Brunt Ave., Dedham, Mass.		③ Carlo Bianchi & Company Inc., Framingham, Mass.		④ Cenedella & Co. 167 Main St., Milford, Mass.		⑤ Arute Bros. Incorporated Bridgewater, Mass		⑥ S. J. Groves & Sons Company, Minneapolis, Minn.		⑦ B. Perini & Sons Inc. Framingham, Mass.		⑧ R. H. Newell Co. Uxbridge, Mass.	
Item No.	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	*Clearing*	15	Acre	100.	1 500.	150.	2 250.	100.	1 500.	300.	4 500.	75.	1 125.	100.	1 500.	100.	1 500.	75.	1 125.
2	*Grubbing*	10	Acre	200.	2 000.	150.	1 500.	50.	500.	10.	100.	50.	500.	100.	1 000.	300.	3 000.	150.	1 500.
3	*Earth Excavation*	30 000	Cu. Yd.	.40	12 000.	.20	6 000.	.30	9 000.	.25	7 500.	.30	9 000.	.50	15 000.	.368	11 040.	.75	22 500.
4	*Excavation of Boulders*	500	Cu. Yd.	.50	250.	.20	100.	2.	1 000.	.01	5.	1.	500.	1.50	750.	10.	5 000.	.75	375.
5	*River Control & Removal of Dam*		Lump Sum		2 500.		1 000.		500.		7 000.		400.		5 000.		43 200.		2 000.
6	*Pervious Embankment*	450 000	Cu. Yd.	.20	90 000.	.20	90 000.	.24	108 000.	.20	90 000.	.25	112 500.	.35	157 500.	.285	128 250.	.50	225 000.
7	*Impervious Embankment*	8 500	Cu. Yd.	.50	4 250.	.75	6 375.	.65	5 525.	.35	2 975.	.50	4 250.	.55	4 675.	.48	4 080.	.75	6 375.
8	*Stone Fill*	10 000	Cu. Yd	1.	10 000.	1.20	12 000.	1.40	14 000.	1.95	19 500.	1.50	15 000.	1.25	12 500.	1.46	14 600.	1.	10 000.
9	*Riprap*	50 000	Cu. Yd.	1.	50 000.	1.20	60 000.	1.40	70 000.	1.15	57 500.	1.50	75 000.	1.50	75 000	1.46	73 000.	1.25	62 500.
10	*Paving*	500	Cu. Yd.	4.	2 000.	5.	2 500.	3.	1 500.	4.50	2 250.	4.	2 000.	3.	1 500.	4.80	2 400.	3.	1 500.
11	*Broken Stone or Screened Gravel*	35 000	Cu. Yd.	.60	21 000.	1.	35 000.	.60	21 000.	1.35	47 250.	1.50	52 500.	1.25	43 750.	1.53	53 550.	1.50	52 500.
12	*Gravel Road Surfacing*	1 500	Cu. Yd.	1.	1 500.	.60	900.	.60	900.	.50	750.	1.	1 500.	1.	1 500.	.50	750.	1.	1 500.
13	*Bituminous Material*	1 000	Gal.	20	200.	.13	130.	.20	200.	.14	140.	.15	150.	.20	200.	.15	150.	.15	150.
14	*Corrugated Metal Pipe*	500	Pound	.15	75.	.15	75.	.20	100.	.25	125.	.20	100.	.10	50.	.20	100.	.10	50.
15	*Wooden Guard Rail*	1 000	Lin. Ft.	.60	600.	.50	500.	.60	600.	.60	600.	.60	600.	.75	750.	.60	600.	.60	600.
16	*Concrete*	1 000	Cu. Yd.	10.	10 000.	12.	12 000.	12.	12 000.	25.	25 000.	9.	9 000.	15.	15 000.	14 50	14 500.	13.50	13 500.
17	*Portland Cement*	1 500	Barrel	3.	4 500.	3.	4 500.	2.80	4 200.	3.60	5 400.	2.60	3 900.	3.	4 500.	2.97	4 455.	2.60	3 900.
18	*Reinforcing Steel*	150 000	Pound	.04	6 000.	.04	6 000.	.04	6 000.	.07	10 500.	.037	5 550.	.06	9 000.	.043	6 450.	.05	7 500.
19	*Miscellaneous Steel and Iron*	1 000	Pound	.20	200.	.04	40.	.15	150.	.10	100.	.20	200.	.15	150.	.20	200.	.15	150.
20	*Cleaning Up*		Lump Sum		500.		1000.		300.		500.		1 000.		3 000.		10 000.		1000.
		Totals			$ 219 075.00		$ 241 870 00		$ 256 975.00		$ 281 695.00		$ 294 775.00		$ 352 325 00		$ 376 825.00		$ 413 725.00

Contract Awarded May 28, 1936
Contract Executed June 23, 1936

CANVASS OF BIDS FOR CONTRACT 52 OPENED JULY 2, 1936.

Item No.	Description	Quantity	Unit	*①		②		③		④		⑤		⑥		⑦		⑧		⑨	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	60	Acre	150.	9 000.	65.	3 900.	150.	9 000.	100.	6 000.	100.	6 000	200.	12 000.	100.	6 000.	100	6 000.	150.	9 000.
2	Grubbing	5	Acre	150.	750.	140.	700.	150.	750.	200.	1 000.	200.	1 000.	75.	375.	200.	1 000.	200.	1 000.	150.	750
3	Earth Excavation	250 000	Cu.Yd	.45	112 500.	22	55 000	.31	77 500.	.50	125 000.	.55	137 500.	.01	2 500.	.30	75 000	.23	57 500.	60	150 000.
4	Rock Excavation, Blasting Not Permitted	1 000	Cu.Yd.	6.50	6 500.	6.	6 000.	6.	6 000.	2.	2 000.	6.	6 000.	6.	6 000.	10.	10 000.	6.	6 000.	30.	30 000.
5	Rock Excavation, Blasting Permitted	125 000	Cu.Yd	1.30	162 500	1.85	231 250	1.	125 000.	1.50	187 500.	3.	375 000.	2.	250 000.	2	250 000.	1.90	237 500.	6.50	812 500.
6	Consolidated Pervious Embankment	25 000	Cu.Yd.	.65	16 250.	.38	9 500.	.40	10 000.	.55	13 750.	.10	2 500.	.34	8 500.	.70	17 500.	.45	11 250	.65	16 250.
7	Rolled Impervious Embankment	20 000	Cu.Yd	.70	14 000.	.38	7 600.	.45	9 000.	.65	13 000.	.48	9 600.	.47	9 400.	.60	12 000.	.45	9 000.	.70	14 000.
8	Embankment, Full-Hydraulic Method	3 550 000	Cu.Yd.	.32	1 136 000.	.38	1 349 000.	.42	1 491 000.	.37	1 313 500.	.425	1 508 750.	43	1 526 500.	40	1 420 000.	.49	1 739 500.	.65	2 307 500.
9	Miscellaneous Embankment	100 000	Cu.Yd.	.35	35 000.	.38	38 000.	.25	25 000.	.25	25 000.	.05	5 000.	.25	25 000.	.30	30 000.	.20	20 000.	.30	30 000.
10	Selected Coarse Material	150000	Cu.Yd.	.60	90 000.	.38	57 000.	.50	75 000.	.55	82 500.	.425	63 750.	.63	94 500.	.50	75 000.	.60	90 000.	.60	90 000.
11	Crushed Stone or Screened Gravel	30000	Cu.Yd.	1.30	39 000.	.55	16 500.	1.	30 000.	1.25	37 500.	1.	30 000	1.86	55 800.	1.	30 000.	1.40	42 000.	2.	60 000.
12	Light Riprap	125 000	Cu.Yd.	.80	100 000.	.75	93 750.	1.	125 000.	1.25	156 250.	50	62 500.	.80	100 000.	1.	125 000.	1.10	137 500.	1.50	187 500.
13	Heavy Riprap	25 000	Cu.Yd	1.50	37 500.	2.50	62 500.	1.75	43 750.	1.50	37 500.	.50	12 500.	1.05	26 250.	1.50	37 500.	1.75	43 750.	1.50	37 500.
14	Paving	3 000	Cu.Yd	4.	12 000	5.50	16 500.	10.	30 000.	5.	15 000.	4.50	13 500.	5.21	15 630.	6.	18 000.	5.	15 000.	7.	21 000.
15	Soil Dressing	70 000	Cu.Yd	.85	59 500.	1.40	98 000.	.70	49 000.	.90	63 000.	.80	56 000.	.53	37 100.	1.	70 000.	1.10	77 000.	1.	70 000.
16	Seeding and Grassing	30	Acre	130.	6 500.	500.	25 000.	200.	10 000.	150.	7 500.	200.	10 000.	190.30	9 515.	100.	5 000.	150.	7 500.	250.	12 500.
17	Gravel Sub-base for Roads	9000	Cu.Yd.	1.25	11 250.	1.10	9 900.	1.	9 000.	.50	4 500.	.43	3 870.	40	3 600.	1.20	10 800.	1.	9 000.	1.	9 000.
18	Broken Stone Base for Roads	2800	Cu.Yd.	6.	16 800	4.50	12 600.	3.	8 400.	4.	11 200.	2.80	7 840.	4.	11 200.	4.	11 200.	4.40	12 320.	4.	11 200.
19	Broken Stone Surface for Roads	4200	Ton	3.70	15 540	2.75	11 550.	4.	16 800.	3.50	14 700.	2.20	9 240.	4.	16 800.	4	16 800.	3.75	15 750.	4.25	17 850.
20	Bituminous Material	60000	Gallon	.15	9 000.	.15	9 000.	.17	10 200.	.20	12 000.	.11	6 600.	.14	8 400.	.20	12 000.	.20	12 000.	.20	12 000.
21	Cable Guard Rail	2000	Lin.Ft	1.	2 000.	.80	1 600.	1.	2 000.	.80	1 600.	.50	1 000.	.51	1 020.	1.50	3 000.	1.25	2 500.	1.50	3 000.
22	Boulder Guard Rail	600	Cu.Yd	3.	1 800.	3.50	2 100.	5.	3 000.	1.50	900.	4.	2 400.	.76	456.	5.	3 000.	4.	2 400.	4.	2 000.
23	Stone Walls	3000	Cu.Yd.	7.	21 000.	12.	36 000.	10.	30 000.	7.	21 000.	6.	18 000.	6.67	20 010.	10.	30 000	10.	30 000	10.	30 000.
24	Drilling Holes in Rock and Masonry	5500	Lin.Ft.	1.30	7 150.	1.	5 500.	1.	5 500.	1.50	8 250.	1.	5 500.	2.	11 000	1.	5 500.	.60	3 300.	3.	16 500.
25	Furnishing and Placing Grout	1500	Cu.Yd.	11.	16 500.	22.	33 000.	12.	18 000.	10.	15 000.	6.	9 000	7.50	11 250.	20.	30 000.	20.	30 000.	25.	37 500.
26	Preparing Rock Surfaces	2500	Sq.Yd.	.65	1 625	1.	2 500.	.50	1 250.	3.	7 500.	2.	5 000.	1.25	3 125.	2.	5 000.	.75	1 875.	.60	1 500.
27	Portland Cement	23000	Barrel	3.40	78 200.	3.	69 000	2.50	57 500.	2.50	57 500.	2.40	55 200.	3.50	80 500.	2.80	64 400.	2.90	66 700.	3.	69 000.
28	Concrete, Class A	3500	Cu.Yd.	11.	38 500.	10.50	50 750.	14.	49 000.	12.	42 000.	10.	35 000.	12	42 000.	10.	35 000.	15.	52 500.	12.	42 000.
29	Concrete, Class B	4500	Cu.Yd.	17.	76 500.	17.50	78 750.	17.	76 500.	15.	67 500.	11.	49 500.	10.	45 000.	20.	90 000.	15.	67 500.	15.	67 500.
30	Concrete, Class C	1400	Cu.Yd	17.	23 800.	16.	22 400.	17.	23 800.	20.	28 000.	7.70	10 780.	8.	11 200.	25.	35 000.	15.	21 000.	15.	21 000.
31	Reinforcing Steel	150000	Pound	.05	7 500.	.06	9 000.	.05	7 500.	.10	15 000.	.051	7 650.	.05	7 500.	.10	15 000.	.05	7 500.	.10	15 000.
32	Stone Masonry, Class A	330	Cu.Yd.	21.	6 930.	165.	54 450.	160.	52 800.	140.	46 200	105.	34 650.	135.	44 550.	50.	16 500.	150.	49 500.	150.	49 500.
33	Stone Masonry, Class B	600	Cu.Yd.	18.	10 800.	55.	33 000.	100.	60 000.	100.	60 000.	76.	45 600.	106.	63 600.	50.	30 000.	100.	60 000.	110.	66 000.
34	Brick Masonry	70	Cu.Yd.	25.	1 750.	50.	3 500.	80.	5 600.	40.	2 800.	40.	2 800.	35.	2 450.	50.	3 500.	50.	3 500.	65.	4 550.
35	Steel Pipe	350000	Pound	.10	35 000.	.10	35 000.	.08	28 000.	.12	42 000.	.065	22 750.	.15	52 500.	.06	21 000.	.09	31 500.	.20	70 000.
36	Mortar Lining for Pipe	17 000	Sq.Ft.	.40	6 800.	.50	8 500.	.25	4 250	.30	5 100.	.24	4 080.	.50	8 500.	1.	17 000.	.40	6 800.	1.	17 000.
37	Miscellaneous Steel and Iron	60 000	Pound	.10	6 000.	.15	9 000.	.15	9 000.	.20	12 000.	.13	7 800.	.10	6 000.	.15	9 000.	.10	6 000.	.10	6 000.
38	Galvanizing	30 000	Pound	.13	3 900.	.10	3 000.	04	1 200.	06	1 800.	.025	750.	.04	1 200.	.10	3 000.	.03	900.	.10	3 000.
39	Miscellaneous Cast Iron	275 000	Pound	.10	27 500.	.12	33 000.	.09	24 750.	.12	33 000.	.072	19 800.	.07	19 250.	.12	33 000.	.06	16 500.	.15	41 250.
40	Miscellaneous Non-ferrous Metal	3 000	Pound	.50	1 500.	1.	3 000.	.60	1 800.	1.	3 000.	.17	510.	.60	1 800.	.75	2 250	.50	1 500.	1.	3 000.
41	Caring for and Setting Metal Work	200 000	Pound	.05	10 000	.05	10 000.	.03	6 000.	.06	12 000.	.0125	2 500.	.04	8 000.	05	10 000.	.02	4 000.	.07	14 000.
42	Miscellaneous Lumber	20	M.B.M	80.	1 600.	100.	2 000.	150	3 000.	60.	1 200.	125.	2 500.	100.	2 000.	100.	2 000.	140.	2 800.	50.	1 000.
43	Twelve-inch Tile Pipe	4 500	Lin.Ft.	1.	4 500.	1.	4 500.	1.50	6 750.	2.	9 000.	.60	2 700.	1.55	6 975.	2	9 000.	1.	4 500.	1.50	6 750.
44	Eighteen-inch Tile Pipe	2 000	Lin.Ft	2.	4 000.	2.	4 000.	2.	4 000.	2.75	5 500.	1.30	2 600.	2.40	4 800.	3.	6 000.	1.60	3 200.	2.25	4 500.
45	Twenty-four-inch Tile Pipe	100	Lin.Ft.	4.	400.	3.	300.	3.	300.	5.50	550.	2.40	240.	3.50	350.	4.	400.	2.65	265.	3	300.
46	Sampling Wells	2 000	Lin.Ft.	1.30	2 600.	1.	2 000.	1.50	3 000.	4.	8 000.	1.	2 000.	2.	4 000.	1.50	3 000.	2.50	5 000.	3.	6 000.
47	Stream Control		Lp.Sum		13 000.		2 000.		5 000.		10 000.		3 200.		6 000.		5 000		10 000.		10 000.
48	Plugging Stream Control Tunnel		Lp.Sum		6 000.		1 000.		2 000.		15 000.		6 000.		6 500.		7 000.		10 000.		10 000.
49	Intake Structure		Lp.Sum		4 000.		5 000.		5 000.		14 500.		5 000.		1 000		5 500.		7 500.		25 000.
50	Maintenance of Engineers Office	20	Month	100.	2 000.	50.	1 000.	200.	4 000.	150.	3 000.	62.	1 240.	100.	2 000.	100.	2 000.	100.	2 000.	200.	4 000.
51	Cleaning Up		Lp Sum		5 000.		1 000		2 000.		5 000.		1 000.		5 000.		5 000.		15 000.		10 000.
	Totals				$2 317 445.00		$2 639 100.00		$2 662 900.00		$2 682 300.00		$2 693 900.00		$2 698 606.00		$2 738 850.00		$3 075 310.00		$4 555 800.00

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.

CONTRACT 52

FOR
CONSTRUCTING THE EMBANKMENT OF THE MAIN DAM OF QUABBIN RESERVOIR IN THE TOWNS OF BELCHERTOWN ENFIELD AND WARE

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①	Benjamin Foster Co. 20th Street and Erie Ave., Philadelphia, Penna.	$2 317 445.00
②	Coleman Groves Company 245 State Street, Boston, Mass.	$2 639 100.00
③	Martin Wunderlich Co. Jefferson City, Mo.	$2 662 900.00
④	West Construction Company 60 State Street, Boston, Mass.	$2 682 300.00
⑤	The Two Companies, Inc., 50 Congress Street, Boston, Mass.	$2 693 900.00
⑥	The Arthur A. Johnson Corporation and Necaro Co. Inc., Enfield, Mass.	$2 698 606.00
⑦	W.E. Callahan Constr. Co., 708 Kirby Building, Dallas, Texas	$2 738 850.00
⑧	The Arundel Corporation, Pier 2 Pratt Street, Baltimore, Md.	$3 075 310.00
⑨	D.M.W. Engineering Corporation of Washington D.C., 2058 Fulton Street, Brooklyn, N.Y.	$4 555 800.00

* Contract awarded, July 16, 1936
Contract executed, August 24, 1936

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.

CONTRACT 54

FOR CONSTRUCTION OF A HIGHWAY IN THE TOWNS OF DANA AND PETERSHAM, WORCESTER COUNTY, MASSACHUSETTS.

CANVASS OF BIDS FOR CONTRACT 54 OPENED MAY 7, 1936.

				★ 1 Carlo Bianchi & Company, Inc., Framingham, Mass		2 Mario Pandolf Company Inc., Needham Heights Mass.		3 Bayer and Mingolla Const. Co.Inc., 10 Peabody St Worcester, Mass.		4 B.F. Construction Co.Inc., 520 Acushnet Ave., New Bedford, Mass.		5 R.H. Newell Co., Uxbridge, Mass.		6 Lawton Construction Co., 79 Lenox Ave., Providence, R.I.		7 Frank J. Shields Inc. Box 302, Southbridge, Mass.		8 J. J. Callahan 119 Park Street West Roxbury, Mass.		9 G. Rosse & Son, Inc., 10 Oxford Street Leominster, Mass.		10 Kelleher Corporation. Turners Falls, Mass.		11 Warner Bros. & Goodwin, Inc., Sunderland, Mass.		12 John A. Gaffey & Son 19 James Street, Medford, Mass.		13 B. Perini & Sons, Inc. Framingham, Mass		14 G. Bonazzoli & Sons Hudson, Mass	
Item	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Roadway Earth Excavation	15 000	Cu. Yd.	.55	8 250.	.30	7 500.	36	9 000.	.45	6 750.	.30	7 500.	40	10 000.	.45	11 250.	.30	7 500.	.45	11 250.	40	10 000.	35	8 750.	38	9 500.	.75	18 750.	.44	11 000.
2	Bridge Excavation	700	Cu. Yd.	.90	630.	2.	1 400.	1.	700.	3.	2 100.	2.50	1 750.	2.	1 400.	2.	1 400.	1.50	1 050	4.	2 800.	2.50	1 750.	.50	350.	250	1 750.	1.	700.	4.	2 800.
3	Ledge Excavation	2 500	Cu. Yd	.33	825.	2.	5 000.	1.	2 500.	1.50	3 750.	2.00	5 000.	40	1 000.	.45	1 125.	2.	5 000.	1.25	3 125.	1.50	3 750.	1.	2 500	250	6 250	.75	1 875.	2.	5 000.
4	Ordinary Borrow	40 000	Cu. Yd	.25	10 000.	.26	10 400.	.32	12 800.	.30	12 000.	.30	12 000.	.40	16 000.	.35	14 000.	.30	12 000.	.34	13 600.	30	12 000.	.25	10 000.	.29	11 600.	.36	14 400.	.50	20 000.
5	Plain Cement Concrete Masanry (1-1½-5)	100	Cu. Yd	17.	1 700.	18.	1 800.	15.	1 500.	14	1 400.	18.	1 800.	18.	1 800.	15.	1 500.	15.	1 500.	18.	1 800.	18.	1 800.	20.	2 000.	19.	1 900.	18.	1 800.	18	1 800.
6	Reinf. Cement Concrete Masanry (1-2-4)	80	Cu. Yd	17.	1 360.	24.	1 920.	18.	1 440.	18.	1 440.	18	1 440.	16.	1 280.	15.	1 200.	18.	1 440.	18.	1 440.	18	1 440.	25.	2 000.	21.	1 680.	21.	1 680.	20.	1 600.
9	Bituminous Material	30 000	Gal	.12	3 600.	.13	3 900.	.125	3 750.	.12	3 600.	13	3 900.	.12	3 600.	.12	3 600.	.14	4 200.	.125	3 750.	.12	3 600.	.15	4 500.	.12	3 600.	.14	4 200.	.12	3 600
10	10" Vitrified Clay Pipe	100	Lin. Ft.	.60	60.	.46	46.	.50	50.	.36	36.	.50	50.	.50	50.	.50	50.	.50	50.	.50	50.	.55	55	.50	50.	.60	60.	.55	55.	.45	45.
11	12" Vitrified Clay Pipe	500	Lin. Ft.	.60	300.	.58	290.	.70	350.	.50	250.	.60	300.	60	300.	60	300.	.60	300.	.50	250.	.65	325.	.65	325.	60	300.	.65	325.	55	275.
12	12" Reinforced Concrete Pipe	1 300	Lin. Ft.	1.	1 300.	.98	1 274.	1.20	1 560.	1.	1 300.	1.	1 300.	1.	1 300.	.95	1 235.	1.	1 300.	.90	1 170.	1.30	1 690.	1.25	1 625.	1.10	1 430.	1.10	1 430.	1.25	1 625.
13	18" Reinforced Concrete Pipe	350	Lin. Ft.	2.	700.	1.85	647.50	2.25	787.50	1.60	560.	2.	700.	2.	700.	1.60	560.	1.50	525.	1.95	682.50	2.	700.	2.50	875.	2.	700.	1.90	665.	2	700.
14	24" Reinforced Concrete Pipe	50	Lin. Ft.	3.	150.	2.65	132.50	4.	200.	3.	150.	3.	150.	3.	150.	2.45	122.50	4.	200.	3.	150.	4	200.	4.	200	3.	150.	2.80	140	3	150.
16	Wooden Guard Rail	200	Lin. Ft.	.60	120.	.55	110.	.50	100.	.50	100.	.55	110.	.50	100.	.50	100.	.75	150.	.50	100.	.70	140.	.60	120.	.85	170.	.60	120.	.60	120.
17	Stone Filling	200	Cu. Yd.	1.50	300.	1.30	260.	1.75	350.	1.50	300.	1.50	300.	3.	600.	2.	400.	1.	200.	1.90	380.	2.50	500.	2.	400.	2.	400.	2	400.	3.	600.
18	Bounds, Delivered and Set	40	Each	6.	240.	6.	240.	3.	120.	5.	200.	8	320.	5.	200.	6.	240.	5.	200.	4.	160.	7.	280.	8.	320.	5.	200.	5.50	220.	7.	280.
19	Catch Basins, except Frames & Grates	2	Each	65.	130.	50.	100.	35.	70.	55.	110.	50.	100.	100.	200.	60	120.	60.	120.	50.	100.	80.	160.	100.	200.	75.	150.	70.	140.	60.	120.
23	Stone Curb Inlets	2	Each	20.	40.	15.	30.	10.	20.	20.	40.	15.	30.	20.	40.	18.	36.	15.	30	15.	30.	20.	40.	18.	36.	21.	42	20.	40.	20.	40.
25	Balance Stone Walls, Removed & Rebuilt	200	Lin. Ft.	.60	120.	.50	100.	.50	100.	.75	150.	.40	80.	60	120.	.50	100.	.40	80.	.50	100.	.50	100.	.50	100.	.50	100.	.50	100.	.50	100.
26	Riprap	50	Cu. Yd	3.	150.	1.	50.	3.	150.	2.	100	2.	100	3.	150.	2.	100.	2.	100.	3.50	175	3.	150.	4.	200.	2.	100.	2.	100.	4.	200.
27	Side Drains with 6" Pipe	400	Lin. Ft.	1.25	500.	1.50	600.	.75	300.	1.	400.	1.25	500.	1.25	500.	1.75	700.	1.	400.	1.10	440.	1.50	600.	1.50	600.	1.25	500.	1.35	540.	2.	800.
30	Gravel Borrow	15 000	Cu. Yd.	35	5 250.	.30	4 500.	.45	6 750.	.40	6 000.	.40	6 000.	40	6 000.	.40	6 000.	.35	5 250.	.39	5 850	.50	7 500.	.60	9 000.	42	6 300.	36	5 400.	.50	7 500.
31	Sand Borrow	800	Cu. Yd.	1.25	1 000.	1.	800.	1.	800.	.75	600.	1.	800.	1.	800	1.	800.	1.	800.	.90	720.	1.50	1 200.	1.50	1 200.	.75	600.	1.75	1 400.	1.35	1 080.
32	Stripping Gravel Pits	2 000	Cu. Yd	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.	.15	300.
33	Gravel Surfacing	300	Cu Yd	1.	300.	.60	180.	.60	180.	.50	150.	60	180.	1.	300.	.70	210.	1.	300.	1.25	375.	1.	300.	.60	180.	.75	225.	1.50	450.	2.	600.
38	Stock Fence	1 000	Lin. Ft.	.15	150.	.15	150.	.35	350.	.20	200.	.20	200.	.20	200.	.18	180.	.18	180.	.24	240.	.20	200.	.20	200.	.18	180.	.17	170.	.16	160.
42	Manholes, except Frames & Grates	1	Each	65.	65.	50.	50.	50.	50	55.	55.	50.	50.	100.	100.	70.	70.	75.	75.	50.	50.	80.	80.	100.	100.	75.	75	70.	70.	60	60.
44	Lumber Sheeting	1	M.B.M	1.	1.	75.	75.	70.	70.	100.	100.	75.	75.	50.	50.	55.	55	50.	50.	75.	75.	90.	90.	75.	75.	75.	75.	80.	80.	60.	60.
46	Fine Grading, Rolling and Finishing	70 000	Sq. Yd.	.03	2 100	.03	2 100.	.02	1 400.	.03	2 100.	.03	2 100.	.02	1 400.	.05	3 500.	.02	1 400.	.03	2 100.	.04	2 800.	.02	1 400.	.04	2 800.	.05	3 500	.01	700.
48	Reinf. for Cement Concrete Structures	55 000	Pound	.04.	2 200.	.0382	2 101.	.04	2 200.	.035	1 925.	.04	2 200.	.05	2 750.	.05	2 750.	.05	2 750.	.045	2 475.	.05	2 750.	.04	2 200.	.043	2 365.	.045	2 475.	.045	2 475.
50	Dry Rubble Masonry	20	Cu. Yd	10.	200.	6.	120.	3.50	70	10.	200.	4.	80.	8.	160.	5.	100.	8.	160.	10.	200.	8.	160.	10.	200.	6.	120.	7.	140.	11.	220.
51	Corrugated Metal Pipe, Removed and Relaid	100	Lin. Ft.	1.	100.	.25	25.	1.	100.	.20	20.	1.	100.	.30	30.	.25	25.	.40	40.	.50	50.	.50	50.	1.	100.	.50	50.	.50	50.	.50	50
57	Lumber Platform	1	M.B.M	1.	1.	75.	75.	75.	75.	80.	80.	75.	75.	50	50.	45.	45.	75.	75.	75.	75.	90.	90.	60.	60.	75.	75.	60.	60.	60.	60.
60	Cobble Stone Gutter	300	Sq. Yd.	1.50	450.	.25	75.	2.	600	2.	600	1.25	375.	1.50	450.	1.25	375.	1.	300.	1.20	360.	1.50	450.	1.50	450.	1.50	450.	2.50	750	2.50	750.
65	Town Line Posts, Delivered and Set	1	Each	20.	20.	15.	15.	10.	10.	10.	10.	10.	10.	10.	10.	20.	20.	15.	15.	10.	10.	15.	15.	40.	40.	35.	35.	20.	20.	10	10.
66	Town Line Posts, Removed and Reset	1	Each	15.	15.	10.	10.	5.	5.	10.	10.	10.	10.	10.	10.	12.	12.	15.	15.	10.	10.	10.	10.	10.	10.	20.	20.	10.	10.	6.	6.
69	Cable Guard Rail	7 200	Lin. Ft.	45	3 240.	.45	3 240.	.45	3 240.	.55	3 960.	.45	3 240.	45	3 240.	55	3 960.	.50	3 600.	.49	3 528.	.55	3 960.	55	3 960.	.75	5 400.	.55	3 960.	.50	3 600.
70	Trench Excavation	1 100	Cu. Yd	1.	1 100.	1.	1 100	.85	935.	.75	825.	1.	1 100.	1.	1 100.	1.50	1 650.	1.	1 100.	.75	825.	1.	1 100	.50	550.	.80	880.	1.50	1 650.	2.	2 200.
72	Clearing and Grubbing	13	Acre	150.	1 950.	100.	1 300.	85.	1 105.	100.	1 300.	125.	1 625.	100.	1 300.	200.	2 600.	100.	1 300.	90.	1 170	100	1 300.	200.	2 600.	150.	1 950.	100.	1 300.	300.	3 900.
73	Channel Excavation	1 200	Cu. Yd	.90	1 080.	.60	720.	.50	600.	1.	1 200.	1.	1 200.	.40	480.	1.	1 200.	1.	1 200	.75	900.	.45	540.	.50	600.	.50	600.	1.	1 200.	1.	1 200.
74	Loam Borrow	2 600	Cu. Yd.	1.	2 600.	.80	2 080.	1.	2 600.	2.	5 200.	1.	2 600.	1.	2 600.	1 50	3 900.	.75	1 950.	.99	2 574.	1.20	3 120.	2.	5 200.	.90	2 340.	1.50	3 900.	2.	5 200.
80	12" Bituminous Coated Corrug. Metal Pipe	100	Lin. Ft.	1.25	125.	1.25	125.	1.25	125.	1.10	110.	1.50	150.	1.50	150.	1.20	120.	2.	200.	1.25	125.	1.50	150.	1.50	150.	1.50	150.	1.45	145.	1.50	150.
81	16" Bituminous Coated Corrug. Metal Pipe	20	Lin. Ft.	2.	40.	1.73	34.60	1.75	35.	1.55	31.	2	40.	2.	40.	1.75	35.	3.	60.	2	40.	2.50	50.	1.90	38.	3.	60.	2.	40.	2	40.
82	12" Cast Irom Pipe	50	Lin. Ft.	2.	100.	2.	100.	4.	200.	1.85	92.50	3.	150.	3	150.	1.	50	2.	100.	3.	150.	3	150.	4.	200.	3.	150.	3.	150.	2	100.
83	Seeding and Grassing	6	Acre	200.	1 200.	242.	1 452.	60.	360.	60.	360.	250.	1 500.	150	900.	25.	150.	500.	3 000	75.	450.	200.	1 200.	200.	1 200	150.	900.	300.	1 800.	350.	2 100.
86	Stone Paving	200	Cu. Yd.	2.50	500.	3.65	730	2.50	500.	1.	200.	3.	600.	3.	600.	2.	400.	2.	400.	3.50	700	6.	1 200.	2.	400.	2.50	500.	3.	600.	11.	2 200.
87	Dummy Posts	100	Each	2.50	250.	2.25	225.	1.	100.	2.75	275.	2.50	250.	1.	100.	2	200.	2.	200.	1.50	150.	3.	300.	3.	300.	3.50	350.	2.75	275.	3.	300.
88	Gravel Mixed-in-Place Surface Course	1 500	Cu. Yd.	1.25	1 875.	.60	900.	1.	1 500.	.50	750.	.75	1 125.	1.20	1 800.	.75	1 125	4.	6 000.	.70	1 050.	1.25	1 875.	2.	3 000.	4.50	6 750.	2.	3 000.	1.	1 500.
89	Loam Berms	1 000	Lin. Ft.	.30	300	.01	10.	.20	200.	.10	100.	.50	500.	.25	250	.25	250.	.25	250.	.50	500.	.50	500.	.50	500.	.15	150.	.15	150.	.50	500
90	Cleaning Borrow Pits	3	Acre	1.	3.	50.	150.	25	75.	30	90.	50.	150.	100.	300.	35	105.	100.	300.	125.	375.	100.	300.	25.	75.	100.	300.	250.	750.	100.	300
91	Plain Cem. Conc. Masonry for Bridges, Class "C"	300	Cu. Yd.	17.	5 100.	17.	5 100.	15.	4 500.	16.	4 800.	17.	5 100.	18.	5 400.	15.	4 500.	15.	4 500.	18.	5 400.	20.	6 000.	20.	6 000.	21.	6 300.	16.	4 800.	18.	5 400.
92	Reinf. Cem. Conc. Masonry for Bridges, Class "B"	350	Cu. Yd.	17.	5 950.	18.	6 300.	20.	7 000.	18.	6 300.	18.	6 300.	18.	6 300.	15.	5 250.	18.	6 300.	20.	7 000.	20.	7 000.	25.	8 750.	25.	8 750.	21.	7 350.	20.	7 000.
		Totals			$ 68 040.00		$ 69 942.60		$ 71 882.50		$ 74 681.50		$ 75 615.00		$ 76 810.00		$ 78 075.50		$ 78 515.00		$ 79 379.50		$ 84 020.00		$ 84 189.00		$ 89 782.00		$ 93 825.00		$ 100 576.00

★ Contract awarded May 7, 1936

Contract executed May 22, 1936

CANVASS OF BIDS FOR CONTRACT 55 OPENED MAY 21, 1936.

Item No.	Description	Quantity	Unit	①		②		③		④		⑤		⑥	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Roadway Earth Excavation	60 000	Cu. Yd.	.50	30 000.	.29	17 400.	.50	30 000.	.38	22 800.	.60	36 000.	.50	30 000.
3	Ledge Excavation	17 000	Cu. Yd.	.50	8 500.	1.56	26 520.	.50	8 500.	1.40	23 800	.60	10 200.	1.50	25 500.
4	Ordinary Borrow	85 000	Cu. Yd.	.30	25 500.	.24	20 400.	.50	42 500.	.38	32 300	.40	34 000	.50	42 500.
5	Plain Cement Concrete Masonry (1-2½-5)	80	Cu. Yd.	17.	1 360.	17.	1 360.	18.	1 440	18.	1 440.	18	1 440.	20.	1 600.
6	Reinf. Cement Concrete Masonry (1-2-4)	100	Cu. Yd.	17.	1 700.	20.	2 000.	20.	2 000.	16.	1 600.	18	1 800.	20.	2 000.
8	Broken Stone	28 000	Ton	2.75	77 000.	2.50	70 000.	2.20	61 600.	2.50	70 000.	2.40	67 200.	2.65	74 200.
9	Bituminous Material	160 000	Gallon	.125	20 000.	.125	20 000.	.12	19 200.	.12	19 200.	.12	19 200.	.13	20 800.
10	10" Vitrified Clay Pipe	1 200	Lin. Ft.	.50	600.	.25	300.	.55	660.	.45	540.	.50	600.	.50	600.
11	12" Vitrified Clay Pipe	150	Lin. Ft.	.75	112.50	.57	85.50	.65	97.50	.60	90.	.65	97.50	.60	90.
12	12" Reinforced Concrete Pipe	2 100	Lin. Ft.	1.	2 100.	.98	2 058.	1.10	2 310.	.90	1 890.	1.05	2 205.	1.	2 100.
13	18" Reinforced Concrete Pipe	700	Lin. Ft.	1.75	1 225.	1.75	1 225.	2.	1 400.	1.90	1 330.	1.75	1 225.	2.	1 400.
14	24" Reinforced Concrete Pipe	200	Lin. Ft.	2.75	550.	2.60	520	3	600.	2.75	550.	3.	600.	3.	600.
15	30" Reinforced Concrete Pipe	275	Lin. Ft.	3.75	1 031.25	3.75	1 031.25	4.75	1 306.25	4.	1 100.	4.25	1 168.75	5.	1 375.
16	Wooden Guard Rail	200	Lin. Ft.	.55	110.	.55	110	.60	120.	.60	120.	.50	100.	.60	120.
17	Stone Filling	200	Cu. Yd.	1.50	300.	1.	200.	2.	400.	1.50	300.	1.	200.	1.50	300.
18	Bounds, Delivered and Set	90	Each	6	540.	5.50	495.	7.	630.	6.	540.	6.	540.	6.	540.
19	Catch Basins (except Frames & Grates)	10	Each	60.	600.	50.	500	50.	500.	60.	600.	60.	600.	50.	500.
23	Stone Curb Inlets	10	Each	20.	200.	15.	150.	20.	200.	18.	180.	18.	180	15.	150.
25	Balance Stone Walls, Removed & Rebuilt	500	Lin. Ft.	.50	250.	.50	250	.50	250.	.50	250.	.50	250.	.40	200.
26	Riprap	900	Cu. Yd.	1.50	1 350.	1.50	1 350.	2.	1 800.	2.	1 800.	1.50	1 350.	3.	2 700.
27	Side Drains with 6" Pipe	1 000	Lin. Ft.	1.50	1 500.	1.50	1 500.	1.20	1 200.	1.25	1 250.	1.	1 000.	1.25	1 250.
28	Side Drains with 10" Pipe	200	Lin. Ft.	2.25	450	1.75	350	1.60	320.	1.50	300.	1.60	320.	1.75	350.
30	Gravel Borrow	35 000	Cu. Yd.	.30	10 500.	.45	15 750.	.50	17 500.	.55	19 250.	.60	21 000.	.50	17 500.
31	Sand Borrow	2 000	Cu. Yd.	1.	2 000.	1.25	2 500.	1.25	2 500.	1.25	2 500.	1.25	2 500.	1.	2 000.
32	Stripping Gravel Pits	5 000	Cu. Yd.	.15	750.	.15	750	.15	750.	.15	750.	.15	750.	.15	750.
33	Gravel Surfacing	2 000	Cu. Yd.	.75	1 500.	.85	1 700.	.90	1 800.	.75	1 500.	.75	1 500.	1.	2 000.
38	Stock Fence	10 000	Lin. Ft.	.15	1 500.	.14	1 400.	.16	1 600.	.14	1 400.	.15	1 500.	.18	1 800.
42	Manholes, (except Frames & Grates)	1	Each	75.	75.	50.	50.	55	55.	60.	60.	75.	75.	50.	50.
44	Lumber Sheeting	1	M.B.M.	50.	50.	.01	.01	100.	100.	1.	1.	75.	75	75.	75.
46	Fine Grading, Rolling and Finishing	180 000	Sq. Yd.	.03	5 400.	.03	5 400.	03.	5 400.	.03	5 400.	.03	5 400.	.04	7 200.
48	Reinforcement for Cement Conc. Structures	4 000	Pound	.05	200.	.04	160	.06	240.	.05	200.	.05	200.	.10	400.
50	Dry Rubble Masonry	200	Cu. Yd.	8.	1 600	6.	1 200.	5.	1 000.	9.	1 800.	5.	1 000.	4.	800.
51	Corrugated Metal Pipe (Removed & Relaid)	200	Lin. Ft.	1.	200.	.50	100	.40	80.	.50	100.	.50	100.	1.	200.
57	Lumber Platform	1	M.B.M.	50.	50.	.01	.01	100.	100.	100.	100.	75.	75.	75.	75.
60	Cobble Stone Gutter	900	Sq. Yd.	1	900.	.75	675.	1.50	1 350.	1.50	1 350.	1.25	1 125.	1.25	1 125.
65	Town Line Posts, Delivered and Set	1	Each	15	15.	15.	15.	15.	15.	20.	20.	20.	20.	20.	20.
69	Highway Guard Rail (including all Materials)	19 000	Lin. Ft.	1.05	19 950.	1.08	20 520.	.85	16 150.	.97	18 430.	1.	19 000.	1.15	21 850.
70	Trench Excavation	3 500	Cu. Yd.	.75	2 625.	1.	3 500.	1.10	3 850.	1.	3 500.	1.25	4 375.	1.50	5 250.
72	Clearing and Grubbing	40	Acre	50	2 000.	155.55	6 222.	125.	5 000.	100.	4 000.	100.	4 000.	125.	5 000.
73	Channel Excavation	200	Cu. Yd.	.50	100.	.75	150.	.50	100.	1.	200.	.50	100.	1.	200.
74	Loam Borrow	18 000	Cu. Yd.	.75	13 500.	.80	14 400.	.90	16 200.	.80	14 400.	1.15	20 700.	1.	18 000.
75	Plain Cement Concrete Masonry (1-2-4)	10	Cu. Yd.	20.	200.	20.	200.	16.	160	18.	180.	16.	160.	20.	200.
78	36" Reinforced Concrete Pipe	86	Lin. Ft.	5.	430.	4.75	408.50	7.	602.	5.50	473.	6.	516.	6.	516.
79	42" Reinforced Concrete Pipe	52	Lin. Ft.	7.	364.	6.20	322.40	10.	520.	6.50	338.	8.	416.	8.	416.
80	12" Bituminous Coated Corrug. Metal Pipe	86	Lin. Ft.	1.25	107.50	1.30	111.80	1.50	129.	1.50	129.	1.35	116.10	1.50	129.
82	12" Cast-Iron Water Pipe	168	Lin. Ft.	2.50	420.	1.75	294.	2	336.	2.	336.	3.50	588.	3.	504.
83	Seeding and Grassing	20	Acre	200.	4 000.	242.	4 840.	200.	4 000.	200.	4 000.	125.	2 500.	250.	5 000.
84	Traffic Signal Duct	200	Lin. Ft.	1.	200.	.50	100.	.75	150.	.60	120.	.50	100.	.50	100.
85	Tar for Bituminous Surface Treatment	1 000	Gallon	.125	125.	.15	150.	.15	150.	.20	200.	.13	130.	.14	140.
86	Stone Paving	250	Cu. Yd.	2.50	625.	3.	750.	5.	1 250.	2.50	625.	2.50	625.	3.	750.
87	Dummy Posts	180	Each	3.	540.	2.70	486.	2.75	495.	2.50	450.	2.50	450.	3.	540.
89	Loam Berms	8 000	Lin. Ft.	.25	2 000.	.01	80.	.25	2 000.	.20	1 600.	.05	400	.20	1 600.
90	Cleaning Borrow Pits	5	Acre	10.	50.	75	375.	100.	500.	1.	5.	50.	250.	50.	250.
93	Peat Excavation	10 000	Cu. Yd.	.50	5 000.	.25	2 500.	.35	3 500.	.40	4 000.	.10	1 000.	.40	4 000.
	Totals				$ 251 955.25		$ 252 914.47		$ 264 635.75		$ 269 597.00		$ 271 042.35		$ 307 315.00

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.

CONTRACT 55

FOR
CONSTRUCTION OF A PORTION OF THE
PETERSHAM – NEW SALEM HIGHWAY IN
THE COUNTY OF WORCESTER, MASS.

	Bidder	Amount
①	Arute Bros. Incorporated Bridgewater, Mass.	$ 251 955.25
②	Mario Pandolf Company Inc., Needham Heights, Mass.	$ 252 914.47
③	Kelleher Corporation Turners Falls, Mass.	$ 264 635.75
④	Carlo Bianchi & Company, Inc Framingham, Mass.	$ 269 597.00
⑤	The Lane Construction Corp. Meriden, Conn.	$ 271 042.35
⑥	R. H. Newell Company Uxbridge, Mass.	$ 307 315.00

Contract awarded June 7, 1936
Contract executed June 23, 1936

CANVASS OF BIDS FOR CONTRACT 57 OPENED JULY 2, 1936.

Item No	Description	Quantity	Unit	①		②		③		④		⑤		⑥	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Roadway Earth Excavation	65,000	CuYd	.34	22,100.	33	21,450.	30	19,500.	30	19,500.	44	28,600	30	19,500.
3	Ledge Excavation	6,000	Cu.Yd	34	2,040.	33	1,980.	30	1,800.	1.	6.000.	44	2,640.	1.50	9,000.
4	Ordinary Borrow	45,000	CuYd	.34	15,300.	33	14,850.	30	13,500.	30	13,500	33	14,850.	.30	13,500.
5	Plain Cement Concrete Masonry (1-2½-5).	140	CuYd	14	1,960.	17.	2,380	16	2,240.	16.	2,240.	19	2,660	18.	2,520.
6	Reinf Cement Concrete Masonry (1-2-4)	120	CuYd	16	1,920.	18.	2,160.	18	2,160.	16	1,920.	20.	2,400	18.	2,160.
8	Broken Stone for Base Course	14,500	Ton	2.10	30,450.	2 18	31,610.	2.25	32,625.	2 35	34,075.	2 15	31,175.	2.30	33,350
9	Bituminous Material	140,000	Gal	.12	16,800.	125	17,500.	.11	15,400.	.125	17,500	.12	16,800.	.125	17,500.
10	10" Vitrified Clay Pipe	250	Lin.Ft	45	112.50	50	125.	55	137.50	70	175	50	125.	.50	125.
11	12" Vitrified Clay Pipe	100	Lin Ft	.50	50.	61	61.	75	75.	.80	80.	.65	65	60	60.
12	12" Reinforced Concrete Pipe	2,000	Lin Ft.	90	1,800.	98	1,960.	1.	2,000.	1.	2,000.	1.10	2,200.	1.	2,000.
13	18" Reinforced Concrete Pipe	140	Lin Ft	1 65	231.	1 75	245.	1 75	245.	2	280	2	280.	1 75	245.
14	24" Reinforced Concrete Pipe	200	Lin Ft.	2.50	500.	2 65	530.	2 75	550.	3 15	630.	2 85	570.	3.	600.
15	30" Reinforced Concrete Pipe	70	Lin Ft	3.50	245.	3 75	262 50	4	280.	4 25	297.50	4 50	315	4	280
16	Wooden Guard Rail.	200	Lin.Ft	.50	100.	45	90.	60	120.	55	110.	60	120	60	120.
17	Stone Filling	100	CuYd	1.	100.	1.	100.	2	200.	1.50	150.	2 00	200.	1.50	150.
18	Bounds, Delivered and Set	80	Each	5.	400.	4.50	360	5	400.	6.	480.	6.	480	6.	480.
19	Catch Basins, Complete in Place.	2	Each	50	100	50.	100.	75	150.	75.	150.	75	150.	75	150.
23	Stone Curb Inlets	2	Each	15	30.	20.	40.	17	34	20.	40	20	40.	15.	30
25	Balance Stone Walls, Removed & Rebuilt	500	Lin.Ft.	.50	250.	.50	250.	50	250.	.50	250.	45	225	.50	250
26	Riprap	200	CuYd	1.50	300.	1.50	300.	1.50	300.	1.50	300.	2.50	500.	2	400.
27	Side Drains with 6" Pipe	1,700	Lin Ft	1.10	1,870.	1.50	2,550.	1.40	2,380.	1.50	2,550	1 30	2,210.	1.25	2,125.
28	Side Drains with 10" Pipe	100	Lin.Ft	1.50	150.	2 00	200.	2	200	2 50	250.	1.65	165	1.75	175.
30	Gravel Borrow	30,000	CuYd	34	10,200.	33	9,900.	.30	9,000.	30	9,000.	.33	9,900.	.40	12,000.
31	Sand Borrow	2,000	CuYd	1.	2,000.	1.00	2,000.	1.	2,000	1	2,000	1.25	2,500	1.	2,000.
32	Stripping Gravel Pits	5,000	CuYd	.15	750.	.17	850.	.10	500.	10	500.	.15	750	20	1,000.
33	Gravel Surfacing	500	CuYd	.34	170	.75	375.	1	500.	75	375.	1.	500.	.60	300.
38	Stock Fence	5,000	Lin Ft.	.13	650.	14	700.	.15	750.	.15	750.	.18	900	.15	750.
42	Manholes, Complete in Place	1	Each	50	50	50.	50	75	75.	75	75.	75.	75	75.	75.
44	Lumber Sheeting	2	M B M	50	100.	75	150.	50.	100.	50	100.	90.	180.	75.	150.
46	Fine Grading, Rolling and Finishing	130,000	SqYd	.02	2,600.	03	3,900.	.03	3,900.	.045	5,850.	.03	3,900.	04	5,200.
48	Reinforcement for Cement Conc Structures.	5,500	Pound	.05	275.	.04	220.	.05	275.	.05	275	06	330.	.05	275.
50	Dry Rubble Masonry	100	CuYd	5.	500	6	600	5	500.	8	800	6	600.	5.	500
51	Corrugated Metal Pipe, Removed & Relaid	50	Lin.Ft	.50	25.	.50	25.	1.	50	1.	50.	1.	50	1.	50.
57	Lumber Platform	1	M B.M	50	50.	50.	50.	50.	50.	50	50.	100.	100.	75	75.
60	Cobble Stone Gutter	700	SqYd	1.	700.	1.	700.	1.	700.	1.	700.	1.50	1,050.	1.25	875.
69	Highway Guard Rail (including all Materials).	15,000	Lin Ft	.90	13,500.	1.	15,000.	1.	15,000.	1	15,000	1.	15,000.	1.15	17,250.
70	Trench Excavation	2,000	CuYd	65	1,300	1.	2,000.	75	1,500	75	1,500	1.10	2,200.	1	2,000.
72	Clearing and Grubbing	29	Acre	60.	1,740	50.	1,450.	400.	11,600.	75.	2,175.	200	5,800.	100.	2,900.
73	Channel Excavation	200	CuYd	.50	100	.50	100.	50	100	1.50	300	.50	100	1.	200.
74	Loam Borrow	7,000	CuYd	75	5,250.	.60	4,200.	75	5,250.	.75	5,250	1.	7,000	1.	7,000.
78	36" Reinforced Concrete Pipe	120	Lin.Ft	4 50	540.	4 75	570	6.	720.	5 75	690.	6.	720.	6	720.
79	42" Reinforced Concrete Pipe	70	Lin.Ft	6.	420.	6.20	434	8.	560.	8.	560	10.	700.	8	560
80	12" Bitum Coated Corrugated Metal Pipe	150	Lin Ft	1.20	180.	1 25	187.50	1 25	187.50	1 25	187.50	1.50	225.	1.50	225.
82	12" Heavy Cast Iron Water Pipe	48	Lin.Ft.	2.	96.	2	96	4	192.	2 50	120	2.	96.	3	144.
83	Seeding and Grassing	8	Acre	100.	800	242	1,936.	200.	1,600.	200.	1,600.	200.	1,600	250	2,000.
85	Tar for Bituminous Surface Treatment.	1,000	Gal.	.12	120.	14	140	.15	150	.125	125	.15	150.	.14	140
86	Stone Paving	150	CuYd	3.	450.	2 50	375	2 50	375	2 50	375.	4	600.	3	450.
87	Dummy Posts, Complete in place.	150	Each	2.	300	2 70	405.	2.70	405.	3.	450.	3	450.	3	450.
89	Loam Berms	4,000	Lin Ft	.05	200.	.05	200	.10	400	25	1,000.	.20	800.	.20	800.
90	Cleaning Borrow Pits	5	Acre	25.	125	50.	250.	25.	125	20	100.	50.	250.	50.	250.
93	Peat Excavation	3,000	CuYd	.50	1,500.	.33	990	.50	1,500.	.30	900.	40	1,200	40	1,200.
94	Screened Gravel.	100	CuYd	2.10	210.	2 50	250	2	200.	3.00	300	2 50	250.	3.	300.
95	Excav & Backfill for 24" Pipe, Sta 141+60±		Lp.Sum		200.		1,000		1,000.		1,000		1,000.		500.
96	Broken Stone for Bitum Surf. Course.	9,500	Ton	2.10	19,950.	2.35	22,325.	2.25	21,375.	2 35	22,325.	2 25	21,375	2.40	22,800
99	Trench Ledge Excavation	100	Cu.Yd	4	400	21 20	2,120.	5	500.	3	300	5.	500.	5	500.
	Totals with Bituminous Macadam.				$ 162,259 50		$ 172,652.00		$ 175,686.00		$ 177,260 00		$ 187,621.00		$ 188,359.00
	Sum of Items 9 and 96				36,750.		39,825.		36,775.		39,825.		38,175.		
	Sub Totals (not including Items 9 & 96)				$ 125,509.50		$ 132,827.00		$ 138,911.00		$ 137,435.00		$ 149,446.00		
97	Bituminous Material (Asphalt Cement)	80,000	Gal.	.12	9,600.	.125	10,000.	13	10,400.	.145	11,600.	.12	9,600.		
98	Oiled Broken Stone	8,000	Ton	3 25	26,000.	3.14	25,120.	3 20	25,600.	3.50	28,000.	3.	24,000.		
	Totals with Penolithic Pavement.				★ $ 161,109 50		$ 167,947 00		$ 174,911.00		$ 177,035.00		$ 183,046.00		

COMMONWEALTH OF MASSACHUSETTS
METR DISTR WATER SUPPLY COMM

CONTRACT 57

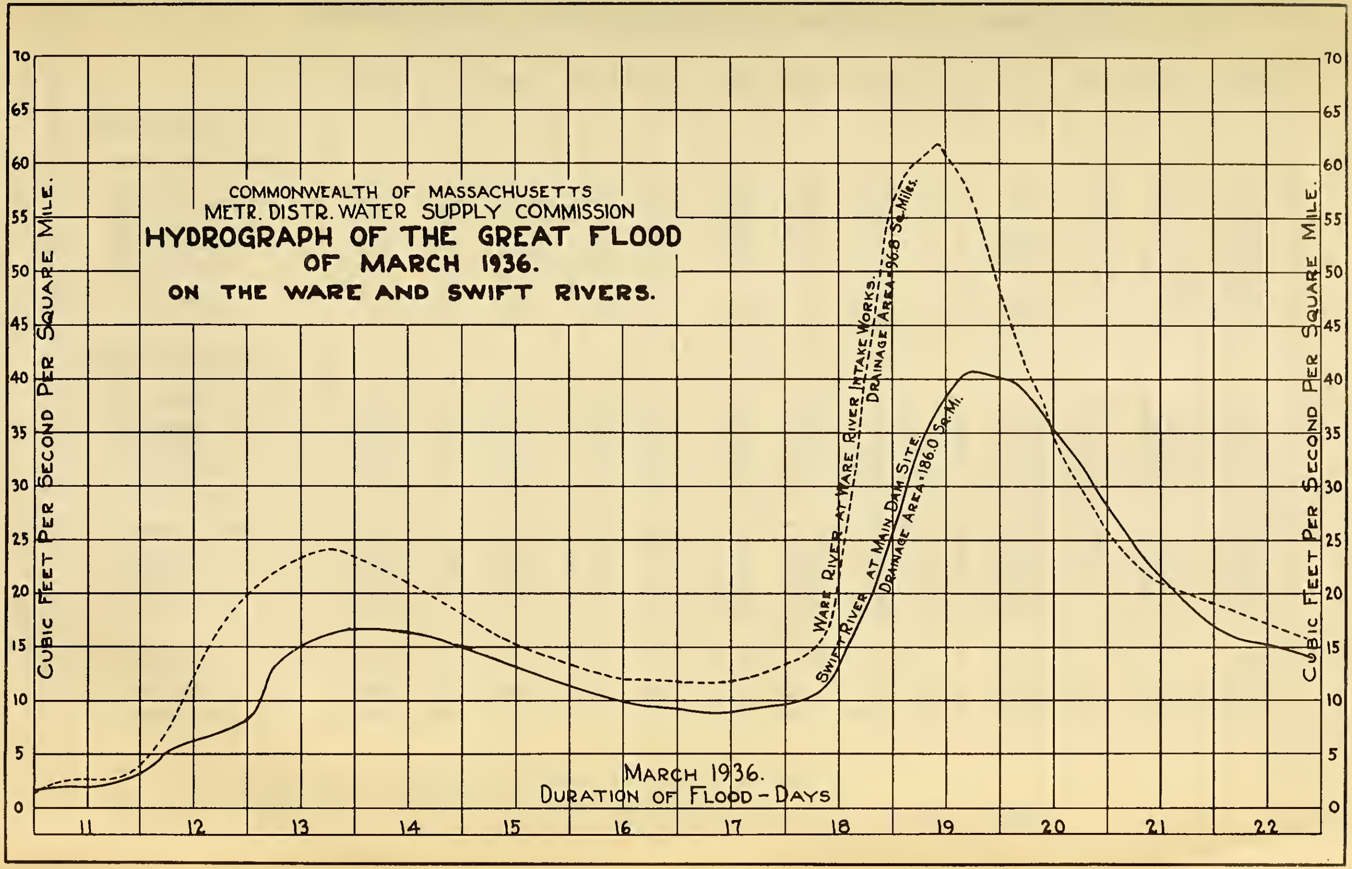
FOR
CONSTRUCTION OF A PORTION OF THE PETERSHAM - NEW SALEM HIGHWAY IN THE COUNTY OF FRANKLIN, MASS.

	Bidder	*
①	John Iafolla Constr Co 11 Van Brunt Ave Dedham, Mass	★ $ 161,109.50-P 162,259.50-B
②	Mario Pandolf Company Inc., Needham Heights, Mass	$ 167,947.00-P 172,652 00-B
③	Middlesex Construction Co, Room 3, Victory Building Framingham, Mass	$ 174,911.00-P 175,686 00-B
④	Arute Bros Inc., Box 112, Bridgewater, Mass	$ 177,035.00-P 177,260.00-B
⑤	Kelleher Corporation Turners Falls, Mass	$ 183,046.00-P 187,621 00-B
⑥	R H Newell Co. Uxbridge, Mass	$ 188,359 00-B

*
P • With Penolithic Pavement
B • With Bituminous Macadam

★ *Contract awarded July 2, 1936 using Penolithic Pavement*

Contract executed Sept 1, 1936



COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
HYDROGRAPH OF THE GREAT FLOOD
OF MARCH 1936.
ON THE WARE AND SWIFT RIVERS.

MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHEDS, 1936

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
WARE WATERSHED													
Ware River Intake Works*	6.64	4.25	9.35	3.73	3.52	4.39	2.26	4.79	5.12	3.10	1.78	7.33	56.26
West Rutland*	6.97	4.27	11.68	4.01	3.79	4.29	2.37	5.48	4.91	3.43	1.68	7.87	60.75
North Rutland	6.38	4.46	9.89	3.73	3.37	3.63	3.14	6.45	4.64	3.95	1.61	8.20	59.45
Williamsville	5.67	2.53	7.16	4.47	3.76	3.86	2.09	6.03	5.38	3.00	1.76	7.21	52.92
Hubbardston	6.17	2.36	8.89	3.59	3.05	4.07	2.11	5.88	5.83	3.28	1.86	6.83	53.92
1936 Mean	6.37	3.57	9.39	3.91	3.50	4.05	2.39	5.73	5.18	3.35	1.74	7.48	56.66
13-year Mean	3.42	2.93	3.82	3.53	3.19	3.72	4.02	4.01	4.75	3.31	3.30	3.14	43.14
SWIFT WATERSHED													
West Ware	5.96	2.53	7.50	3.99	3.30	3.70	2.29	4.22	4.43	2.26	1.84	5.58	47.60
Enfield	6.91	2.85	8.60	4.81	3.12	4.24	2.29	5.39	5.60	2.66	2.15	6.62	55.24
Greenwich	7.43	2.69	8.53	4.62	2.66	4.10	1.93	5.28	5.47	2.63	2.07	6.60	54.01
North Dana	7.83	3.54	9.36	4.09	2.46	4.24	3.41	6.26	6.69	2.95	2.03	6.31	59.17
Dana	7.17	3.08	8.97	4.80	2.64	3.02	2.31	5.32	5.67	2.61	1.97	6.77	54.33
Packardsville	5.98	2.36	7.53	4.84	3.09	4.46	2.38	4.86	5.87	2.96	2.21	4.81	51.35
Prescott	6.26	2.72	8.31	4.08	2.40	4.02	2.09	4.48	5.60	2.93	1.84	6.03	50.76
Shutesbury	6.92	3.98	10.02	4.39	2.85	4.75	2.14	5.88	6.96	3.72	2.51	6.93	61.05
New Salem	6.89	3.19	9.48	4.37	1.84	4.19	2.81	6.32	6.27	3.32	2.01	6.44	57.13
Wendell	6.89	2.74	8.42	5.80	1.67	4.55	3.75	5.95	4.70	3.42	2.35	6.48	56.72
Petersham**	7.51	3.41	9.35	4.04	2.40	3.40	2.43	5.63	4.31	3.04	2.40	6.91	54.83
1936 Mean	6.89	3.01	8.73	4.53	2.58	4.06	2.53	5.42	5.60	2.95	2.12	6.32	54.74
17-year Mean	3.46	2.99	3.67	4.14	3.41	4.61	4.06	4.17	4.57	3.13	4.00	3.32	45.53

* Station maintained by Metropolitan District Water Supply Commission.

** Station maintained by Metropolitan District Commission.

Data for all other stations obtained through courtesy of State Department of Public Health.

Public Document No. 147

MASS.
DOCS.
COLL.

The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING NOVEMBER 30, 1937

PUBLICATION OF THIS DOCUMENT APPROVED BY THE COMMISSION ON ADMINISTRATION AND FINANCE

1M-4-'38. No. 3618

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1937, its

TWELFTH ANNUAL REPORT

I. Organization and Administration

Eugene C. Hultman continued as Chairman of the Commission and Thomas D. Lavelle and Edward J. Kelley as Associate Commissioners. R. Nelson Molt continued as Secretary. Three special agents under the direction of the Commission continued to care for the property acquired by the Commission in the Swift River and Ware River areas.

Real estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 157 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 536 persons.

A force of local labor of 96 persons was employed during the year in forestry and reforestation work, the removal of bodies, miscellaneous work and burning brush and slash on the area below the future reservoir flow line, subsequent to the discontinuance on January 22, 1937 of the unemployment relief project undertaken in 1936 under the instructions of the Honorable Governor and Council.

The clerical force of the Commission's office was reduced upon the cessation of the clearing project work.

During the year, disposition by trial was made by the Attorney General as counsel for the Commission of pending petitions for damages and the petition of Maher and Duggan before a Board of Referees for land owned by them in the town of Greenwich, this being the second trial of the petition.

II. Engineering Department

Frank E. Winsor continued as Chief Engineer, Karl R. Kennison as Assistant Chief Engineer, Walton H. Sears as Mechanical Engineer and William W. Peabody as Division Engineer of the Quabbin Reservoir and Aqueduct Division with an office at Enfield, Massachusetts.

At the request of the Attorney General consultants were employed from time to time when necessary in preparation of data for the defense of petitions for damages against the Commonwealth and for the collection and interpretation of data on mill and water power damages, and on design of dam and dike of Quabbin Reservoir and geological data.

III. Offices.

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission building at 20 Somerset Street, Boston. Offices at various places on the work were occupied from time to time as required and the laboratories for water analysis and soil testing were continued at Enfield.

IV. Real Estate and Water Rights

The Commission, for reservoir purposes and sanitary protection, has acquired a total of approximately 69,791 acres of land in the Swift River watershed, and for sanitary protection and construction purposes in the Ware River watershed a total of about 13,849 acres.

The Commission in September, 1937, as a sanitary measure, ordered that all future farm operations cease on areas owned by the Commission within the area to be flowed by Quabbin Reservoir and that all buildings owned by the Commission in the town of Prescott be sold and removed as soon as possible as well as all buildings owned by the Commission within six miles of the Intake Building at Coldbrook at the Ware River watershed.

The Commission publicly advertised from time to time for sealed proposals for the purchase of about sixteen million feet of standing timber within the area to be flowed by Quabbin Reservoir and accepted the highest proposals received therefore.

V. Ware River Supply

The Rutland-Holden sewer was operated throughout the year to divert from the Ware and Wachusett watersheds the sewage of the U. S. Veterans Hospital and the State Sanatorium in Rutland.

Water was diverted from the Ware River from time to time between December 12, 1936, and January 9, 1937 inclusive, and the temporary chlorinating plant in the upper watershed of the Ware River was operated from time to time as required.

Real estate and topographic surveys were carried on during the year and preparation of record and taking plans of property acquired were continued.

Reforestation and sanitary surveys were continued, and area within six miles upstream from the Intake Building at Coldbrook bounded and "No Trespassing" signs posted.

The remaining buildings of the former Prison Camp at Rutland were publicly advertised and sold at public auction and the area generally cleaned up.

Upon the request of the Department of Conservation the Commission permitted the use of Cunningham Pond, so-called, in the town of Hubbardston as a breeding pond for fish under the supervision of said Department.

VI. Swift River Supply

Real estate and topographic surveys were continued during the year. Reforestation of areas above the flow line of Quabbin Reservoir was continued and additional nurseries established, seed beds planted and transplanting and seedlings carried on. Surveys of a general taking for Quabbin Reservoir area were in progress and a taking line generally established and voted by the Commission. The Commission continued its policy of salvaging young pine, spruce, hemlock, laurel, azaleas, etc., to be flooded by Quabbin Reservoir.

Full cooperation was secured from the officials of the Harvard State Forest in the town of Petersham and their expert opinion secured relative to the planting of seed beds and cultivation and care of seedlings and reforestation program.

Fire lanes were kept clear above the flow line of Quabbin Reservoir affording protection to the transplants set out on the watershed of Quabbin Reservoir as well as the large areas of standing timber.

In view of the great amount of brush and slash left from timber operations and the remains of the clearing project the Commission is gratified to report no loss of timber on land of the Commonwealth by fire during the past year, all incipient fires being put out promptly without damage by the equipment of the Commission under the direction of the engineering force.

The Two Companies, Inc., completed the work under Contract 38, for the construction of a core wall to sound rock at the site of the main dam of Quabbin Reservoir. The final estimate under said contract being paid and a release of any and all claims of the Two Companies, Inc., being received upon advice and with the approval of the Attorney General of the Commonwealth.

Cenedella & Company completed the work under Contract 49 for excavating diversion channels at Shafts 11A and 12 of Quabbin Aqueduct. Cenedella & Company presented claims which the Commission refused to pay and referred the matter to the Attorney General.

Franklin A. Snow Company completed the work under Contract 51, for constructing the East Branch Baffle at the site of Quabbin Reservoir in the towns of Greenwich and Hardwick and presented claims which the Commission refused to pay, and, suit being brought, the matter was placed in the hands of the Attorney General for defense.

Vincent Caira, Newtonville, Mass., completed work under Contract 47 for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the town of Greenwich and the English Construction Company, Lowell, Mass., completed the work under Contract 53 for constructing the head house at Shaft 9 of Quabbin Aqueduct in the town of Barre.

Carlo Bianchi & Company, Inc., Framingham, Mass., completed work under Contract 54 for constructing and improving a section, in the towns of Dana and Petersham, of the highway along the east side of the future Quabbin Reservoir.

Contract 55 awarded to Arute Bros., Incorporated, Bridgewater, Mass., and Contract 57 awarded to John Iafolla Construction Company, Dedham, Mass., were completed and this State highway, eight miles long, extending across the northerly end of the Quabbin Reservoir from Petersham to a connection near North New Salem with the Daniel Shay Highway, Route 202, was turned over to and accepted by the Department of Public Works to be thereafter maintained by it as part of the highway system of the Commonwealth.

Benjamin Foster Company continued work under Contract 52, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware. The central portion of the embankment has been carried to about elevation 462, a height of 81 feet above the original river bed, and approximately 1,997,000 cubic yards out of a total of 3,695,000 cubic yards required in the embankment under this contract having been placed to date.

The policy of publicly advertising for bids on all construction work was continued and Contract 56 was awarded on June 24 to Rich Bros. Construction Co., Inc., Boston, Mass., the lowest bidder, for constructing the administration buildings at the main dam of Quabbin Reservoir in the town of Belchertown. Work is in progress under this contract.

Contract 59 was awarded on March 18 to the Wachusetts Artesian Well Company, West Boylston, Mass., the lowest bidder, for drilling a well for the water supply of the administration buildings in the town of Belchertown. The work was completed.

The Commission on November 2 authorized the advertising for sealed proposals to be publicly opened and read on December 2, 1937, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich.

VII. General

The engineering force continued its studies for the development of hydroelectric power at various points on the work. No electric power can be generated, however, until the completion of Quabbin Reservoir provides the necessary storage of water.

At the request of His Excellency the Governor and the Honorable Council, the Commission submitted the following communications relative to the work of the Commission:

November 1, 1937.

Subject: Work under Way and in Prospect.

Eugene C. Hultman, Esq., Chairman,
Met. Dist. Water Supply Commission,
20 Somerset Street, Boston, Mass.

Dear Sir: In compliance with your request, I submit herewith a statement of work required to be done to complete the work entrusted to the Metropolitan District Water Supply Commission under Chapter 375 of the Acts of 1926 and Chapter 321 of the Acts of 1927, and also work required under Chapter 48 of the Resolves of 1936.

Contracts in Progress

Contract 50. Embankment at Dike. This work is nearing completion and is expected to be completed this year.

Contract 52. Embankment at Main Dam. Contract required to be completed in 1940.

Contract 56. Administration Buildings at Main Dam. Required to be completed in 1938.

Contract 58. Borings in connection with investigations for pressure tunnel under Chapter 48 of Resolves in 1936. Work is expected to be completed during November, 1937.

Equipment for Shaft 12 and for Main Dam. To be delivered in 1937-1938.

Other Work in Preparation

Contract for road leading to Shaft 12, about two miles in length, to be completed in 1938.

Maintenance building at Shaft 8, to be completed in 1938.

Maintenance building at Shaft 1, to be completed in 1939.

Building at outlet chamber and power plant at Main Dam, to be completed in 1940.

Equipment for hydroelectric plant at Main Dam, to be completed in 1940.

Equipment for gates at Shaft 1 of Quabbin Aqueduct, to be completed in 1938.

Equipment for hydroelectric plant at Shaft 1 of Quabbin Aqueduct, to be completed in 1940.

Quinapoxet diversion works into Quabbin Aqueduct, to be completed in 1939.

Shallow flowage dam on upper end of East Branch of Quabbin Reservoir, near outlet of Pottapoag Pond, to be completed in 1938.

Shallow flowage dam in upper end of Middle Branch of Quabbin Reservoir, to be completed in 1938.

Clearing and cleaning up areas to be flowed by Quabbin Reservoir so far as practicable as the water rises, to be done from 1938 to 1945.

Fire stop lanes and narrow gravel access roads leading to Quabbin Reservoir for forest fire prevention, with similar work on the Ware River near Coldbrook, to be done from 1938-1940.

Reforestation of areas to be purchased around Quabbin Reservoir and in the Ware watershed, to be completed in 1945.

Landscaping at Dam and Dike, at Shaft 12 and around other structures as required, to be completed in 1938 to 1941.

Roads, etc., connecting the Main Dam and Dike and passing over Quabbin Hill, to be completed in 1940.

Gaging station on Swift River below Main Dam, to be completed in 1939.

Improvement of sanitary conditions on Ware and Wachusett watershed, to be done in 1938 to 1940.

In Addition to the Preparation of Designs and Supervision of Construction, the Engineering Force is charged with the following work:

Surveys. Completion of real estate surveys and plans, at Quabbin Reservoir and on the Ware River. Exclusive of tunnel takings, 83,548 acres have been purchased to Oct. 23, 1937, of which 80,291 acres have been surveyed, and final tracings made of about 46,200 acres. From 15,000 to 20,000 acres of additional land will be required to be surveyed and final tracings will be required of about 55,000 acres. Topographic surveys have been made to Oct. 23, 1937, of 42,423, of which about 39,000 have been traced. Additional topography to cover roads for fire stops, swamp drainage, etc., will involve an additional 10,000 to 15,000 acres of surveys.

As a comparison it is of interest to note that the land area of the City of Boston is only 28,100 acres, and of the twenty cities and towns making up the Metropolitan Water District only about 117,000 acres.

Cemeteries. The total number of bodies to be removed is estimated to be in excess of 6,000, of which 4,285 have been removed to Oct. 23, 1937.

Chapter 48, Resolves of 1936. Chapter 48 of the Resolves of 1936 provides "for an investigation by the Metropolitan District Water Supply Commission and the Department of Public Health relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District."

This investigation is being made by the force of the Commission, and borings are nearing completion under Contract 58.

Surveys for a pressure tunnel or pressure aqueduct from the terminal chamber of the Wachusett Aqueduct in Northboro to the Metropolitan District in Weston, and surveys for a pressure tunnel forming a loop through the Metropolitan Water District are in progress and are well advanced. Sanitary surveys of the watersheds of the Sudbury, Wachusett, Ware and Swift supplies are practically completed. Aerial maps showing these surveys have been prepared, and work is in progress on a report of sanitary conditions throughout the areas used for Metropolitan Water Supply.

A report on this investigation is required to be available for consideration by the Legislature of 1938, and this report will include preliminary designs for pressure tunnel and shafts, pressure aqueducts, distribution reservoirs and other appurtenances. Maps showing the location, depth and geology of the tunnel location and a draft of suggested legislation will accompany the report.

Takings. The preparation of general taking plans, both for Quabbin Reservoir and the Ware, will be necessary and will involve additional surveys of outer boundaries in order to define these boundaries by courses and distances. The taking plans for Quabbin Reservoir will involve a change in town and county lines and should be completed and recorded in 1938. The taking plans for the Ware will probably be completed and recorded in 1939 or 1940.

The outside boundaries of all takings will be marked by stone bounds in accordance with the practice of the Metropolitan District Commission, and it is estimated that from 1,500 to 2,000 such bounds will be required.

Preparation for defense of river diversion suits due to the prospective taking of waters of the Swift River. Several large suits are still in prospect because of this diversion.

Preparation for defense of suits for land takings, etc., which will probably be brought when final takings are filed.

Contract Drawings, Specifications and Supervision of Construction

In addition to contract drawings and specifications required for the greater part of the above items, working drawings are required, lines and grades are given for construction, careful inspection is required, and measurements (usually semi-monthly) are made for partial payments to contractors. Final measurements and estimates are made at the completion of contracts.

Equipment. Several boats, including at least two power boats and at least one hydroplane, will be required for rapid transportation for fire prevention, inspection, etc., and it will be desirable to provide several landings around Quabbin Reservoir. This equipment, including fire apparatus, should be available in 1940 to 1941. The sanitary control and care of the large areas owned by the Commission on the Swift and Ware watersheds, some 145 square miles or nearly three times the land area of the City of Boston and three-fourths of the combined land area of the cities and towns constituting the present Metropolitan Water District, will require adequate equipment which should be so housed as to be quickly available as needed. The sanitary inspection of the entire tributary watersheds of the Swift, Ware and Wachusett supplies, about 400 square miles, may be advantageously combined in the future when hydroplane transportation becomes available.

Record Plans. Record plans must be prepared of all structures as built. Some work has been done on such plans, as time has permitted, and these plans should be completed while the men familiar with the work are still available. It is essential for the proper maintenance and operation of the work that such plans be accurate and be prepared with great care, so far as practicable, by the men who had been connected with the construction. Owing to the pressure of other work, new contracts, etc., there still remains much of this important work to do.

The Department of Public Works requires record plans of the 34 miles of State road which have been or will be accepted by it. Record plans for 5 miles of these roads have been furnished to the Department and the remainder are being prepared.

The above summary is not intended to be a complete statement of all work to be done, but to cover only the more important obvious items required for completion of the project.

Respectfully,

Frank E. Winsor, *Chief Engineer.*

November 2, 1937.

SUBJECT: Administration, Engineering, etc.
Overhead Costs

Eugene C. Hultman, Esq., Chairman, Met. Dist. Water Supply Commission,
20 Somerset Street, Boston, Mass.

DEAR SIR: The cost of overhead, including administration, engineering, etc., for the Metropolitan District Water Supply Commission from the inception of the work in 1926 to October 1, 1937, is as follows:—

Administration	......	$316,050.	0.78%
Engineering:			
Commission's Payroll	$3,161,406.		
Other expenses including sub-surface investigations by wash and diamond drill borings, test pits, aerial surveys, transportation and incidentals	592,765.		
Consultant expenses:			
Design and construction	88,000.		
Connecticut case	49,942.		
Boston & Albany R.R. and other real estate	10,781.		
Diversion Damages:			
General investigations, preparation for trial and settlements	124,342.		
Used at trials	75,473.	4,102,709.	10.12%
Real Estate including appraisals, legal expenses, etc.		270,486.	.67%
Legal and expert expense other than engineering in connection with settlement and litigation of diversion claims:			
Expenses of trials	95,723.		
Cost of preparation, cases litigated	103,000.		
Cost of preparation, negotiated settlements	153,776.	352,499.	.87%
Police and fire protection		73,922.	.18%
Total		$5,115,666.	12.62%

Total expenditures to Oct. 1, 1937	$40,642,683.
Expended on special investigations, chapters 18 and 48 of 1936 and not included in above tabulation of overhead expenses	108,536.
Amount used in computation of percentages in above tabulation	$40,534,147.

Respectfully,
FRANK E. WINSOR, *Chief Engineer.*

November 1, 1937.

SUBJECT: Expenditures

EUGENE C. HULTMAN, ESQ., *Chairman,*
Met. Dist. Water Supply Commission,
20 Somerset Street, Boston, Mass.

DEAR SIR: I attach hereto for your information statement of amount authorized for use of the Metropolitan District Water Supply Commission, together with a statement of expenditures to date and total estimated expenditures for completion of the work.

I call your attention to expenditures aggregating about $350,000 which are included in the expenditures to November 1, 1937, of $40,919,939.67 and which were not contemplated in the original plan. These expenditures include investigation and construction of the Rutland-Holden sewer under Chapter 66 of the Resolves of 1931 and Chapter 262 of the Acts of 1932; investigation of the use of Lake Cochituate for recreational purposes, etc., Chapter 18 of the Resolves of 1936; and investigation for improvement of the distribution system and sanitary protection of Metropolitan water, Chapter 48 of the Resolves of 1936.

It has been my endeavor to allow liberally for future expenditures, and it is quite possible that the total expenditures may be substantially less than indicated, in which case the surplus will be increased by the same figure.

Respectfully,
FRANK E. WINSOR, *Chief Engineer.*

The following memorandum shows the approximate financial status of the work of the Metropolitan District Water Supply Commission as of November 1, 1937:

MONEY AVAILABLE

Original authorizations:		
Chapter 375 of the Acts of 1926	$15,000,000.00	
Chapter 321 of the Acts of 1927	50,000,000.00	
Chapter 111 of the Acts of 1927 $900,000.00. Of the money authorized by Chapter 111 in the Sudbury River District, $638,533.83 was spent and the remainder has reverted to the Treasury	638,533.83	$65,638,533.83
Receipts to Nov. 1, 1937		860,351.33
Total available funds for work		$66,498,885.16

ESTIMATE OF EXPENDITURES

Expenditures to Nov. 1, 1937 (Includes about $350,000 for work not originally contemplated)		$40,919,939.67
Contracts:		
No. 33, New England Power Co. Electric Current	10,000.00	
No. 47, Vincent Caira. Buildings at Shaft 12	4,000.00	
No. 49, Cenedella & Co. Diversion Channels, Quabbin Reservoir	2,500.00	
No. 50, The Arthur A. Johnson Corp. Embankment at Dike	150,000.00	
No. 52, Benjamin Foster Co. Embankment at Main Dam	1,660,000.00	
No. 53, The English Construction Co. Building at Shaft 9	1,200.00	
No. 57, John Iafolla Construction Co. Petersham-New Salem Road	20,000.00	
No. 58, Pennsylvania Drilling Co. Borings in connection with investigations for pressure tunnel, under Chapter 48 of Resolves of 1936	15,000.00	
No. 56, Rich Bros. Construction Co., Inc Administration Buildings at Main Dam	327,000.00	
Miscellaneous small contracts	60,000.00	
Without contract price:		
Stop shutters, racks, etc. Shaft 12 and at Main Dam	40,000.00	
Equipment for Administration Buildings, hydroplane, boats and furnishings	100,000.00	
Superstructure, water wheel, generator, etc. outlet works at Main Dam	150,000.00	
Clearing of Quabbin Reservoir, including reclearing from time to time as water rises	3,000,000.00	
Fencing	750,000.00	
Reforestation, fire stops, fire lanes, etc.	600,000.00	
Removal of cemteries	60,000.00	
Shallow flowage dams—one on the East Branch and one on the Middle Branch of the Swift River	200,000.00	
Service building at Shaft 8	20,000.00	
Service building at Shaft 1	10,000.00	
Valves, water wheels, generator, etc. at Shaft 1	80,000.00	
Gaging station below Main Dam of Quabbin Reservoir	50,000.00	
Road connecting Dam and Dike over Mount Quabbin, together with miscellaneous landscaping, etc.	250,000.00	
Extensions and connections to Worcester-Holden sewer	75,000.00	
Quinapoxet diversion works	200,000.00	
Improvement of swamps	200,000.00	
Real Estate:		
Purchases, taxes and miscellaneous costs	1,250,000.00	
Diversion damages	3,000,000.00	
	$12,284,700.00	
Administration, engineering and general overhead, 10%	1,228,470.00	$13,513,170.00
Total estimated expense		$54,433,109.67
Estimated surplus		$12,065,775.49

November 2, 1937.

Mr. Eugene C. Hultman, *Chairman*,
20 Somerset Street, Boston, Massachusetts.

Dear Sir: I attach hereto a tabulation of the amount of the verdicts of the diversion cases tried and trial expenses, showing maximum estimates reported by the Commission's engineers and the claim of the owners at the trials.

There is also attached a list of the cases settled by the Commission for the Swift and Ware diversions, showing the amounts paid, the estimates of the commission's engineers and the claims of the owners.

Finally, there is attached a memorandum of the verdicts in the two trials of the Maher & Duggan case, showing the claims of the owners.

Very truly yours, R. Nelson Molt, *Secretary*.

November 1, 1937

VERDICTS OF CASES TRIED AND TRIAL EXPENSES

	Amounts of Verdicts	**Amounts Paid** *Judgments, Interest and Costs*		*Maximum Damage Estimates Reported by Commission's Engineers*	*Claims of Owners*	*Trial Expenses*
BARRE WOOL COMBING CO. (Verdict returned 7/20/35)	$189,304.67	Judgment, including interest from 7/20/35-9/3/35, and costs of suit, $26.50 . .	$190,208.95	$190,545.00	$807,100.00	$9,061.82
GEO. H. GILBERT MFG. CO. . . Original verdicts $45,856.25 259,852.08 (Verdicts returned 1/4/34)	305,708.33	New trial ordered in case in Hampshire County and settlement made for .	260,000.00	55,620.00	1,111,000.00	29,757.55
ARTHUR W. HOLBROOK . . (Verdict returned 7/24/36)	9,660.00	Judgment, incl. interest & costs . (Judgment incl. int. $9,697.03) (Costs 288.50)	9,985.53	No admission of damages	63,000.00	13,529.10
LUDLOW MANUFACTURING CO. (Verdict returned 12/22/36)	52,275.00	Judgment, incl. interest & costs . . (Judgment incl. int. $52,623.50) (Costs 395.00)	53,018.50	50,000.00		41,041.87
NATIONAL SCALE CO. (Verdict returned 1/15/37)	Verdict for Commonwealth			No admission of damages		4,456.18
OTIS COMPANY . . . . . Original verdicts $29,698.00 162,699.97 (Verdicts returned 4/17/36)	192,397.97	Judgment, incl. interest & costs . . (Judgment incl. int. 29,816.79) (Costs 48.50) (Judgment incl. int. 163,350.77) (Costs 763.99)	193,980.05	97,000.00	296,200.00	38,391.50
WARE WOOLEN COMPANY . (Verdict returned 1/30/36)	88,786.91	Judgment, incl. interest & costs . . (Judgment incl. int. 89,142.06) (Costs 778.15)	89,920.21	75,000.00	280,800.00	29,307.53
WARE VALLEY MFG. COMPANY (Verdict returned 6/17/36)	17,765.22	Judgment, incl. interest & costs . . (Judgment incl. int. 18,042.36) (Costs 488.55)	18,530.91	15,000.00	76,000.00	13,912.82
	$855,898.10		$815,644.15	$483,165.00	$2,634,100.00	$179,458.37

November 1, 1937

CASES SETTLED BY AGREEMENT

Company	*Located on*	*Diversion Covered by Settlement*	*Amount Paid*	*Date of Payment*	*Estimate of Commission's Engineers*	*Claims of Owner*	*Remarks*
Ames Sword Co.	Chicopee	Ware & Swift	$ 2,500.00	2/7/34	$ 7,000.00	$ 15,000.00	
Barre Falls Reservoir Co. . .	Ware	Ware	4,800.00	12/5/36	......	7,500.00*	Settlement, made by Office of Attorney General after jury was impaneled, includes purchase by Commonwealth of real estate and Water rights
Dana S. Courtney Co. . . .	Chicopee	Ware & Swift	10,000.00	5/9/34	8,500.00	16,000.00	
Chicopee Mfg. Corporation . .	Chicopee	Ware & Swift	250,000.00	8/10/33	300,000.00	375,000.00	
Dwight Mfg. Co.	Chicopee	Ware & Swift	225,000.00	12/2/31	275,000.00	275,000.00	
Indian Orchard Co. . . .	Chicopee	Ware & Swift	375,000.00	9/28/34	393,600.00	425,000.00	
Northern Conn. Power Co. . .	Conn.	Ware & Swift	30,000.00	8/1/34	20,000.00	201,000.00	
Quinnehtuk Company . . .	Chicopee	Ware & Swift	140,000.00	7/12/33	135,000.00	153,000.00	
T. E. Rich Company . . .	Ware	Ware	3,250.00	6/26/33	5,000.00	5,000.00	
A. G. Spalding & Bros. . .	Chicopee	Ware & Swift	12,000.00	8/9/33	12,000.00	12,000.00	
Thorndike Co.	Ware	Ware	25,000.00	4/28/32	32,500.00	172,500.00	
Geo. W. Wheelwright Paper Co. .	Ware	Ware	35,000.00	5/24/33	18,000.00	75,000.00	

*For damages only—does not include real estate

November 1, 1937.

VERDICTS OF MAHER & DUGGAN CASE

FIRST TRIAL	*Amounts of Verdicts*	*Amounts Paid* (Finding, interest, etc.)	*Maximum Damage Estimates Reported by Commission's Engineers*	*Claims of Owners*	*Trial Expenses*
MAHER & DUGGAN . . . . (Finding returned 1/25/34)	$221,000.00	Hearing before Board of Referees. Retrial ordered by Supreme Court.	$57,000.00	$400,000.00	$14,192.63
SECOND TRIAL . . . . (Finding returned 7/28/37)	150,000.00	Finding, including interest from 9/15/33 - 7/29/37 at 5% per annum $179,041.67 Finding $150,000.00 Interest 29,041.67	57,000.00	365,000.00	29,664.69

November 1, 1937.

SUBJECT: Quabbin Reservoir— General Road Program

EUGENE C. HULTMAN, ESQ., *Chairman,*
Met. Dist. Water Supply Comm.
20 Somerset St., Boston, Mass.

DEAR SIR:—The Metropolitan District Water Supply Commission under the provisions of Chapter 321 of the Acts of 1927 was charged with the duty of providing when reasonably practicable and public necessity or convenience required, other suitable ways in lieu of those in the Quabbin Reservoir area which would be discontinued by the construction of the reservoir. The practicability, public necessity and convenience and the location and character of any such new ways to be determined by agreement between the Commission and the county commissioners of the county or counties in which any such discontinued ways were situated and if they were unable to agree by the Department of Public Works.

At the time of the passage of the Act there was a north and south road through the Swift River Valley, a narrow tarred gravel road being a part of Route #21 and running generally from Springfield through Ludlow and Belchertown and thence through Enfield, Greenwich and North Dana to Athol. The other main thoroughfare was a road leading from Ware to the village of Enfield and thence to the town of Belchertown providing an outlet for travel from Ware to Holyoke, Northampton and Amherst. It was apparent to the Commission that these roads as well as many dirt roads would have to be discontinued and in 1931 the Commission started its road construction program.

The Commission conferred with the county commissioners of Hampshire County and subsequently with the Department of Public Works and as a result of a written agreement signed by all parties thereto the location and plans for about 5.2 miles of bituminous macadam roads in the towns of Ware and Belchertown in Hampshire County including a concrete bridge over the Swift River was determined as the first necessary and practical substitute road to provide access to structures to be built and to allow certain roads to be closed as required by the program of construction.

By this agreement the highway was to be built to the specifications of the Department of Public Works, its construction entirely supervised by engineers of this Commission and the Department of Public Works agreeing to pay for the surfacing and guard rail for the same and to upon its completion accept and maintain it as part of the highway system of the Commonwealth.

This road was completed in 1932 at a total cost of $225,707.19 of which the Department of Public Works by its agreement paid $95,726.94 for the guard rail and surfacing and the Commission paid $129,980.25.

The road was completed to the satisfaction of the Commission and accepted by them and in turn accepted by the Department of Public Works and is a portion of State Route #9 which is an alternate to state Route #20 and which extends from Boston to Pittsfield via Worcester, Ware, Amherst and Northampton.

Quabbin Park Cemetery, established by the Commission for the reinterment of the remains from Cemeteries in Quabbin Reservoir area, is adjacent to this highway as is the site of the Administration Buildings now under construction near the main dam of Quabbin Reservoir. The road not only has provided during the period of reservoir construction a direct route for traffic from Worcester and other points east of Worcester to Pittsfield, but has led the Department of Public Works to do further work on Route #9 which has made it a main artery of travel from New York State to Boston.

In 1933 the second project of road construction was started and under the same circumstances, namely, by written agreement with the county commissioners of Hampshire and Franklin Counties and with the Department of Public Works, the Commission laid out and constructed a bituminous macadam road in accordance with the specifications of the Department of Public Works from the junction of Route #9 in Belchertown through the town of Pelham in Hampshire County and New Salem in Franklin County to the Orange line, a total distance of 20.8 miles of which 9.1 miles are in Hampshire County and 11.7 miles are in Franklin County.

Subsequently, this road was extended by the Department of Public Works through Orange to Athol where it joins the so-called Mohawk trail or Route #2 of the Commonwealth. This road known as the Daniel Shays Highway forms a part of the United States Route #202 which extends from Wilmington, Delaware to Bangor, Maine. This road has become very heavily traveled, especially in the summertime and in the fall, and as it skirts the western side of Quabbin Reservoir it not only is a through road but serves as a point of local interest to the Commonwealth because of the observation points which have been constructed at various points which permit an excellent opportunity to view the reservoir.

The total cost of this road is $801,676.64 of which the Department of Public Works paid $302,277.59 for the surfacing and guard rail while the Commission paid the balance of the cost at $499,399.05.

In 1936, after conferring with the county commissioners of Franklin and Worcester Counties and with the Department of Public Works and reaching a written agreement with terms the same as the other agreements, the Commission laid out and constructed a highway in the towns of Petersham and New Salem a distance of 7.98 miles. This road, a bituminous macadam road built to the specifications of the Department of Public Works, is located 4.34 miles in Worcester County and 3.64 miles in Franklin County. The road extends from the junction of the Worcester-Athol Road in the town of Petersham westerly to the Daniel Shays Highway and it is the understanding of the Commission that the Department of Public Works will ultimately carry the road westward from the Daniel Shays Highway to the Mohawk trail or Route #2 of the Commonwealth. As in the case of Daniel Shays Highway the Department of Public Works will pay for the surfacing and the guard rail.

By the construction of this road which skirts the north end of Quabbin Reservoir, through traffic from Worcester and other towns in its vicinity as well as from the City of Boston coming over the Worcester Turnpike to Worcester are afforded a direct route to the Mohawk trail and one which by-passes the town of Petersham and towns of Athol and Orange. This program as above described was approved by the Commissioners of the three counties involved and has been accepted in writing by them in substitution of and in lieu of roads to be discontinued. The Department of Public Works has accepted these roads and their maintenance as part of the general highway system of the Commonwealth.

The Commission in 1936 also constructed about 1.8 miles of highway in the towns of Dana and Petersham of gravel surface mixed and placed with tar and thus completed a gap in a road from Hardwick Center to Petersham on the east side of Quabbin Reservoir, other portions of which were being constructed in a like manner by the town of Hardwick and the county of Worcester. The construction of this road was undertaken after an agreement had been reached by the county commissioners of Worcester as to the location and type of road required. The road was completed in 1936 and was constructed at a cost of $63,840.60.

The program has provided on the west side of Quabbin Reservoir a standard highway for north and south traffic which has won approbation not only from the towns which it serves but the traveling public at large, and it has provided at the north and south ends of the reservoir east and west traffic roads of standard construction which gives direct connections to other main thoroughfares and by-pass local communities where traffic hazards were many as in Athol and Orange.

This road system has created a junction point at Belchertown for traffic which can divert to the western and southern parts of the Commonwealth and provides an outlet for through traffic to the state of Connecticut and other points south as well as New York and other points west, and it has also provided at Orange a junction point for the northerly and northwesterly parts of the Commonwealth and the states of Maine, New Hampshire and Vermont with direct connections to the Green and White Mountains.

Finally, the Commission has afforded protection to Quabbin Reservoir, for most of the road construction is without the drainage area but still near enough to allow the traveling public to view the major part of the reservoir and the major items of construction.

In addition, the Commission has submitted to the Council and has received its approval of a service road from a point in the town of Hardwick to Shaft #12 of Quabbin Reservoir. Surveys and plans for a road to give access for the public to and across the main dam and dike to an observation point on Mt. Quabbin are being made. This road in addition to giving the public a general view of the reservoir is of the utmost importance for fire protection and access to property and structures.

Respectfully, Frank E. Winsor, *Chief Engineer.*

VIII. Special Investigations

On November 3, 1937, His Excellency the Governor requested that the Commission employ an expert engineer not attached to the force of the Commission to pass on the economy and adequacy of the works constructed by the Commission and the desirability of the future projects proposed by the Commission. In compliance with the request of His Excellency the Commission on November 8 voted to employ Thaddeus Merriman, Consulting Engineer for the New York Board of Water Supply, the Metropolitan District of Southern California on the Aqueduct from the Colorado River to Los Angeles, on flood control plans in Los Angeles, California, Consulting Engineer of the Tennessee Valley Authorities, etc., to report on the following subjects:

"You will review the work already done and make such comment on its efficiency and economy as you may deem will be in the public interest.

Second, you will go over the plans for the completion of the work, estimates, etc., and determine upon their expediency and cost, and when the work should be done.

Third, you will also consider the future extensions of the Metropolitan Water System, in general covered by a special report to be made under Chapter 48 of the Resolves of 1936, which report is made in answer to a resolve of the Legislature, in regard to the desirability of by-passing the Sudbury Reservoir, distribution of the main supply by pressure tunnels, the necessity for sanitary protection, etc.

The Commission would like to have your report as soon as practicable, and will you kindly advise us how soon you can begin to work on this."

As required by Chapter 48 of the Resolves of the Legislature for the year 1936, the Joint Board, consisting of the Commission and the Department of Public Health, continued its investigation relative to improvements in the distribution system and allied matters, particularly the possible construction of a pressure distribution tunnel from the Wachusett source of supply to the Metropolitan District. Contract 58 was awarded on March 23 to Pennsylvania Drilling Company, Pittsburgh, Pa., the lowest bidder, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, in connection with this investigation. The work was completed at the end of the year. A report in accordance with the provisions of said resolve was prepared and filed in the manner and at the time prescribed.

IX. Cemeteries

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 1,598 bodies were removed from the Quabbin Reservoir area during the year, of which 1,522 were interred in Quabbin Park Cemetery. To date a total of 4,624 bodies have been removed from the Quabbin Reservoir area; of which 3,703 were interred in Quabbin Park Cemetery. There have been 28 original burials during the year in Quabbin Park Cemetery, making a total to date of 117 original burials in this cemetery.

In addition to cemeteries in which burials were discontinued by order of the Commission on August 25, 1932, further interments have been prohibited in the following cemeteries:

Town	*Cemetery*
Dana	Dana Center, Brown's Evergreen, Williams, Stone, Richardson, Hopkins.
Enfield	Packardsville, Packardsville Church.
New Salem	Golden Lake
Petersham	Snow

In addition, no further interments have been made in the Isaac Linzie Cemetery, Prescott, Mass.

Landscaping and maintenance of Quabbin Park Cemetery have been carried on during the year and studies made for the location and construction of a permanent service building.

X. FINANCIAL

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

XI. OTHER REPORTS

The report of the Chief Engineer is herewith presented.

XII. RECOMMENDATIONS

The Commission, having established its general taking line for the Quabbin Reservoir area, and the protection thereof, have determined that there will be so little left of the town of Dana which has not already been acquired by the Commission, or included within the general taking line, as to make impossible the future corporate existence of the town and suggest hereto an amendment, which accompanies this report, to Chapter 321 of the Acts of 1927 in substance providing for the ultimate annexation of portions of Prescott and Greenwich as well as the town of Dana to the town of Petersham in the county of Worcester.

Respectfully submitted,

E. C. HULTMAN, *Chairman*
THOMAS D. LAVELLE, *Associate Commissioner*
EDWARD J. KELLEY, *Associate Commissioner*

20 SOMERSET STREET, BOSTON, MASS.
January 15, 1938.

Draft of proposed legislation:

THE COMMONWEALTH OF MASSACHUSETTS

In the year One Thousand Nine Hundred and Thirty-Seven

An Act providing that the town of Dana in the county of Worcester, and certain portions of the towns of Prescott and Greenwich in the County of of Hampshire be annexed to the town of Petersham in the county of Worcester.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. Chapter 321 of the Acts and Resolves of the year 1927 is hereby amended by striking out all of Section 13 and inserting therefor the following:

SECTION 13. Upon the expiration of thirty days from the recording of an order of taking as provided by section four of this act by which taking, together with previous purchases or takings as provided by said section four, of land in the towns of Dana, Enfield, Greenwich and Prescott, the whole or a substantial part of said towns is taken, and after notice thereof to the towns to be affected by annexation as hereinafter described in this section, the territory within the towns of Dana, Enfield, Greenwich and Prescott shall be annexed to the adjacent towns, and to the counties in which such adjacent towns are located in the following manner:

(a) There shall be annexed to the town of New Salem, and thereby to Franklin county, those portions of the towns of Prescott, Greenwich and Enfield, being portions of Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of New Salem, Prescott and Shutes-

bury and following the existing channel of the west branch of the Swift river in a general southerly direction to its confluence with the Swift river; thence following the existing channel of the Swift river and its middle branch in a general northeasterly direction to the point where it is crossed by the boundary line between the towns of Prescott and Dana; thence following the boundary line between the towns of Prescott and Dana in a general northerly direction to its intersection with the boundary line of the town of New Salem; thence following the boundary line between the towns of New Salem and Prescott in a general westerly direction to the point of beginning.

(b) There shall be annexed to the town of Petersham, and thereby to Worcester County, all of the town of Dana, and those portions of the towns of Prescott and Greenwich, being portions of Hampshire county, bounded as follows: beginning at the point where the middle branch of the Swift river crosses the boundary line between the towns of Dana and Prescott and following the existing channel of said middle branch in a general southerly direction to its confluence with the east branch of said river; thence following the existing channel of said east branch in a general northeasterly direction to the boundary line between the towns of Greenwich and Hardwick; thence following the boundary line between the towns of Greenwich and Hardwick in a general northeasterly direction to its intersection with the boundary line of the town of Dana; thence following the boundary line between the towns of Dana and Greenwich in a general northerly direction to its intersection with the boundary line of the town of Prescott; thence following the boundary line between the towns of Dana and Prescott in a general northerly direction to the point of beginning.

(c) There shall be annexed to the town of Hardwick, and thereby to Worcester county, that portion of the town of Greenwich, being a portion of Hampshire county, bounded as follows: beginning at the most westerly corner stone on the boundary line between the towns of Hardwick and Greenwich located about two thirds of a mile southerly from the outlet of East pond; thence running due west to the existing channel of the east branch of the Swift river; thence following the existing channel of said east branch in a general northeasterly direction to its intersection with the boundary line between the towns of Hardwick and Greenwich; thence following said boundary line between the towns of Hardwick and Greenwich in a general southerly direction to the point of beginning.

(d) There shall be annexed to the town of Ware those portions of the towns of Greenwich and Enfield, all of said towns being in Hampshire county bounded as follows: beginning at the aforesaid most westerly corner stone on the boundary line between the towns of Hardwick and Greenwich located about two thirds of a mile southerly from the outlet of East pond; thence running due west to the existing channel of the east branch of the Swift river; thence following the existing channel of said east branch and of the Swift river in a general southwesterly direction to the intersection of the boundary line of the towns of Ware, Belchertown and Enfield; thence following the boundary line between the towns of Ware and Enfield in a general easterly direction to its intersection with the boundary line of the town of Hardwick; thence following the boundary line between the towns of Hardwick and Enfield in a general northerly direction to its intersection with the boundary line of the town of Greenwich; thence following the boundary line between the towns of Hardwick and Greenwich in a general northerly direction to the point of beginning.

(e) There shall be annexed to the town of Belchertown that portion of the town of Enfield, both of said towns being in Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of Belchertown, Pelham and Enfield; thence running due east to the existing channel of the west branch of the Swift river; thence following the existing channel of said west branch and of the Swift river in a general southerly direction to the boundary line between the towns of Belchertown and Enfield; thence following the boundary line between the towns of Belchertown and Enfield in a general northwesterly direction to the point of beginning.

(f) There shall be annexed to the town of Pelham that portion of the town of Enfield, both of said towns being in Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of Belchertown,

Pelham and Enfield, thence running due east to the existing channel of the west branch of the Swift river; thence following the existing channel of said west branch in a general northerly direction to the intersection of the boundary lines of the towns of Prescott, Pelham and Enfield; thence following the boundary line between the towns of Pelham and Enfield in a westerly and southerly direction to the point of beginning.

Section 2. Section 14 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the second, tenth, twentieth, twenty-ninth and forty-third lines of said Section 14, and substituting the word "four" for the word "three" in the fifteenth line of said Section 14, and by substituting the word "Petersham" for "Dana" in the twenty-third line in said Section 14, so as to read as follows:

Section 14. All the property belonging to the towns of Dana, Enfield, Greenwich and Prescott, shall upon the annexation of said towns to adjacent towns by authority of this act, vest in and become the property of the commonwealth for the benefit of the metropolitan water district, and the commonwealth shall succeed to all the rights, claims and causes of action of each of said towns, and shall assume and be liable for all the debts, obligations, trusts, duties and liabilities of each of said towns. All actions and causes of actions by or against the said towns of Dana, Enfield, Greenwich and Prescott pending or accrued, when such annexation takes effect, shall survive, and may be prosecuted to final judgment and execution by or against the commonwealth. All books, papers, monies and other property in the possession of the treasurer of each of these four towns or of any town officer thereof shall be turned over to the commission at the time of said annexation, and the commission shall wind up and liquidate the affairs of each such town as speedily as possible. Upon the final liquidation of the affairs of each the towns of Dana, Enfield, Greenwich and Prescott, the commission shall turn over such of the records of said towns respectively as are of permanent value to the towns of Belchertown, Petersham and New Salem, respectively, and said records shall be preserved with the records of the town to which they have been so turned over.

Upon such annexation the division of accounts of the department of corporations and taxation shall audit the books and accounts of the collector of taxes of each of the towns of Dana, Enfield, Greenwich and Prescott, respectively, and all taxes assessed for the year of such annexation and remaining uncollected, except taxes assessed upon property acquired by the commission under the second paragraph of section four of this act, to persons residing or property located within the territory annexed to another town shall be, by the assessors of the town in which such taxes were assessed, committed to the collector of taxes of the town to which such territory is by the provisions of this act annexed. It shall be the duty of any collector of taxes to whom any such taxes are committed to complete the collection of such taxes with legal interest and costs and pay over the same to the treasurer of the town for which he is the collector.

Upon the annexation to adjacent towns of the territory within the towns of Dana, Enfield, Greenwich and Prescott as set forth in this act, the commission or the metropolitan district commission shall yearly in the month of November reimburse each of said adjacent towns for all money paid out or expenses incurred under the laws of the commonwealth for the year preceding in the relief or aid of persons whose settlement was gained in whole or in part whether by original acquisition or derivation within the territory annexed to each of said towns respectively prior to the date of such annexation.

Section 3. Section 15 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the thirteenth line of said Section 15, so as to read as follows:

Section 15. Annexation under this act shall constitute the annexed territory part of the town and the county to which it is annexed with respect to the jurisdiction of the courts, as well as for all other purposes. All suits, proceedings, complaints and prosecutions, and all matters of probate, which shall be pending at the time of such annexation before any court or trial justice, or such matters as may be incident thereto, may however be heard and determined and prosecuted to final judgment and execution before such court or justice as if said annexation had not taken place; but upon such annexation taking place, the several courts and trial justices having jurisdiction over the respective towns to which the territory within said towns of Dana, Enfield, Greenwich and Prescott is annexed shall have jurisdiction of all civil actions, matters of probate and insolvency and criminal prosecutions thereafter begun, although the cause of action has accrued, or crime, offense or misdemeanor has been committed, before such annexation, in the same manner and to the same extent as if such territory had been annexed prior to the accrual of the cause of action or the commission of the crime, offense or misdemeanor.

Section 4. Section 16 of said Chapter 321 is hereby amended by adding the word "Dana," before Enfield in the first line of said Section 16, so as to read as follows:

Section 16. An inhabitant of the town of Dana, Enfield, Greenwich or Prescott, when annexed to an adjacent town by authority of this act, who remains upon the annexed territory, or who removes to a place within the limits of the town to which the land upon which he resided has been annexed, as such limits existed prior to such annexation, shall have the same right to vote at a town meeting in such town, or at an election of town officers, that he would have had if the annexed territory had constituted a part of said town for six months prior to such meeting or election.

Section 5. Section 17 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the second line of said Section 17, so as to read as follows:

Section 17. During any interval between the annexation of said towns of Dana, Enfield, Greenwich and Prescott and the taking possession of the land taken therein by the commission under this act, the commission shall maintain the public ways, public schools and other public works and public institutions in said towns to such extent and in such manner as the commission may deem necessary for the convenience, comfort and welfare of the inhabitants remaining therein.

Section 6. Section 20 of said Chapter 321 is hereby amended by adding the word "Dana," before Enfield in the eighteenth and twenty-fourth lines of said Section 20, so as to read as follows:

Section 20. The provisions of sections six and seven of Chapter fifty-nine of the General Laws shall be applicable to land acquired in fee by the commission under this act for reservoir purposes or for the protection of the reservoir except to land within the present limits of the towns of Enfield, Greenwich and Prescott. On the land in these three named towns acquired previous to the date of their annexation, the Commission shall pay to each said town in which the respective land is located until such time as the annexation of said town, as provided in section thirteen of this act, a sum in lieu of taxes computed and paid as provided in said sections six and seven of said chapter fifty-nine, but including for this period the buildings and structures thereon. Subsequent to said annexation neither the commission nor the metropolitan district commission shall pay any taxes or make any payments in lieu of taxes on land or buildings within the present limits of the said towns of Dana, Enfield, Greenwich and Prescott.

As full compensation for any loss of taxation or any other loss caused by the carrying out of the provisions of this act, the commission shall pay the county of Hampshire the sum of fifty-five thousand dollars, which sum shall be paid at the time of the annexation of the towns of Dana, Enfield, Greenwich and Prescott to adjacent towns.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

GENTLEMEN:—The following is a report of the engineering department for the year ending November 30, 1937.

ORGANIZATION

On account of the completion, early in the year, of the Quabbin Reservoir clearing project, the engineering organization has, notwithstanding the requirements for handling the work of special investigations and sanitary surveys necessitated by Chapter 48 of the Resolves of 1936, been decreased during the year about 12 per cent.

Karl R. Kennison, Assistant Chief Engineer, continued in charge of all studies in connection with the general plan of the work and the design of structures, preparation of contract specifications, contract and working drawings.

Charles L. Coburn and Stanley M. Dore, Associate Civil Engineers, continued their general supervision of the detailed work of the office, and Walter H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages. They have assisted in the preparation of contract specifications. William W. Peabody, Division Engineer, continued in charge of the Quabbin Reservoir and Aqueduct Division.

Charles T. Main, consulting engineer of Boston, Thaddeus Merriman, consulting engineer of New York, and other experts were employed from time to time. Illness prevented Dr. Charles P. Berkey, geologist of Columbia University from continuing his services as a consultant. Warren J. Mead, geologist of Massachusetts Institute of Technology was employed as a consultant on problems in connection with the special investigation of a deep pressure tunnel to improve the distribution system.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1936	Nov. 30, 1937
Headquarters Office, Designing Division	44	52
Coldbrook Office, Quabbin Reservoir and Aqueduct Div.	34	11
Enfield Office, Quabbin Reservoir and Aqueduct Div.	93	88
Total Engineering Force	171	151

The maximum force during the year was 171, during the week ending December 5, 1936. The minimum force was 147, during the week ending March 20. The average force for the year was 157.

OFFICES

The office of the Chief Engineer and Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. The offices of the Quabbin Reservoir and Aqueduct Division in the Ware River intake building in Coldbrook and in the property of the Commonwealth formerly known as the Frances W. Chandler house on Quabbin Road in Enfield, were continued throughout the year. Branch offices were maintained at other locations where work under important contracts was in progress. The laboratories for water analysis and for soil testing were continued in the property of the Commonwealth formerly known as the Barlow house, in Enfield. The branch office for handling the Quabbin Reservoir clearing project in Enfield was discontinued January 22.

HEADQUARTERS OFFICE

Summary of the Year's Work

Real Estate.—Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 2,843 acres, making a total reported on to date of 84,531 acres.

PROGRESS OF REAL ESTATE PURCHASES FOR QUABBIN RESERVOIR

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1937	2,376
Total to Nov. 30, 1936	67,415
Total to Nov. 30, 1937	69,791

Options outstanding Nov. 30, 1937, include 455 acres.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 5,332 acres, making a total reported on to date of 21,280 acres.

PROGRESS OF REAL ESTATE PURCHASES FOR WARE RIVER WATERSHED PROTECTION

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1937	3,274
Total to Nov. 30, 1936	10,575
Total to Nov. 30, 1937	13,849

Options outstanding Nov. 30, 1937, include 1,016 acres.

Real estate taking plans were prepared and filed during the year as shown in the appended table.

Water Diversion Damage Claims. — Data were prepared for the use of the attorneys in water diversion cases before the courts.

Contracts and Specifications. — Plans and specifications were completed for Contract 56, for constructing the administration buildings at the main dam of Quabbin Reservoir in the Town of Belchertown. The contract was executed July 28.

Plans and specifications were prepared for Contract 58, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, in connection with the special investigation required by Chapter 48 of the Resolves of 1936. The contract was executed March 30.

Specifications were prepared for Contract 59, for drilling a well for the water supply of the administration buildings in the Town of Belchertown. The contract was executed March 30.

Plans and specifications were prepared for Contract 60, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich. The contract was advertised November 13 for opening of bids on December 2, 1937.

Working drawings for Contracts 50, 52 and 56 were prepared and issued.

Inspection and Tests. — E. L. Conwell and Company continued the testing of cement. The Worcester Polytechnic Laboratory continued the testing of concrete cylinders furnished under Contracts 52 and 56. Structural and reinforcing steel furnished under Contract 56 and stone for use on Contract 60 were inspected and tested by the New England Inspection Bureau of Cambridge, Mass. Stone for use on Contract 56, and iron and steel stop shutters, racks and lifters purchased for installation in the Swift River intake works at Shaft 12 and in the release control works at the main dam were inspected by the engineering force.

Hydrographic Data. — The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

With the cooperation of the Enfield office, a study was made of methods of determining future releases from Quabbin Reservoir by observations of the flow of the Connecticut River, in order to satisfy the requirements of the U. S. War Department.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was continued in cooperation with that company and the U. S. Geological Survey.

The gaging station on the Swift River above the intake to the stream control tunnel at the main dam was continued.

Coöperation with the United States Geological Survey in the operation and maintenance of the gaging station on the Swift River near the outlet of Pottapaug Pond in Hardwick and on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations, in order to obtain data for use in the defense of claims against the Commonwealth for damages due to diversion of water from these rivers.

Ware River Diversion

Ware River water was diverted into Wachusett Reservoir December 12 to January 9, inclusive. No water was diverted between May 31 and December 1. At other times, although the daily flow in the river was sufficient to permit diversion, no diversion except as above stated was made because of the present inadequacy of storage capacity in the reservoirs of the District. The quantity of water diverted during the year was 4,551,700,000 gallons. The steel bulkhead and gates, about 2,200 feet west of Shaft 8, prevent any flow of the Ware River westerly during diversion. This bulkhead will be removed upon the completion of Quabbin Reservoir.

Sewage Diversion from Ware River Watershed

The Rutland-Holden sewer continued in operation. During the fiscal year of the City of Worcester which includes the 12 months ending December 31, 1937, 51,597,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 29,916,000 gallons came from the U. S. Veterans Hospital.

Investigation of Distribution System

Work was continued in accordance with the requirements of Chapter 48 of the Resolves of 1936, relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District.

Distribution System. — Studies were made of the adequacy of the distribution system of the Metropolitan Water District and of the systems of the cities and towns in the District, of the present and anticipated water consumption requirements, of the feasibility of constructing a pressure aqueduct to deliver water to the District by gravity from the Wachusett Aqueduct Terminal Chamber, of the possibility of eliminating pumping at the Chestnut Hill and Spot Pond pumping stations, and of the cost of pressure tunnels and other types of pressure aqueduct.

Surveys of Aqueduct Lines. — Investigations and field surveys were made to determine the location of shafts for the construction of a pressure distribution tunnel, of a cut- and-cover pressure aqueduct and of new high-service distributing reservoirs.

Contract 58. — Bids were opened March 18, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. Six bids were received, ranging from $52,950.00 to $116,930.00, two from contractors in New York State, three in Pennsylvania and one in Minnesota. The contract was executed March 30 with the Pennsylvania Drilling Company, Pittsburgh, Pa., the low bidder. Under this contract, 76 borings were made along the line of the proposed pressure tunnel, particularly where the depth to bedrock and its character could not be determined from surface outcrops. Work was started with the drilling of the first hole April 12 and was practically completed at the end of the year, the last hole being actually completed December 3, 1937.

The value of work included in contract estimates to November 15, the date of the latest estimate was $49,771.11, of which 90 per cent was approved for payment. The contractor worked in mixed shifts and his total force averaged 18 men for a period of 33 weeks.

The principal items of plant were as follows:

3 Churn drills
4 Light tripod drills
9 Core drills

The total work done under the items of Contract 58 is as follows:

Borings in earth	7,195 lin. ft.
Borings in bedrock and boulders	10,420 " "
Satisfactory rock core recovered (as measured for payment) . .	9,590 " "

Sanitary Surveys of Watersheds. — Sanitary surveys were made of the Sudbury, Wachusett, Ware and Swift watersheds. Data for this purpose were obtained from the Metropolitan District Commission and the Department of Public Health. The field surveys were started May 14. Samples were taken and bacteriological examinations were made of numerous points on the watersheds. Methods of disposal of sewage and wastes from manufacturing plants and private premises on the watershed were examined. Maps showing all features of the occupation of all the watersheds were made, one including the North Sudbury watershed, one including the South Sudbury watershed, one including the principal areas in the vicinity of Wachusett Reservoir, all on a scale of 1 inch = 800 feet, and one showing the Swift, Ware and Wachusett watersheds on a scale of 1 inch = 2000 feet. All industrial plants and private premises on the watershed were examined.

Aerial Photographs and Maps. — In connection with this investigation, an aerial survey was made of the entire Sudbury, Wachusett, Ware and Swift watersheds, scale 1 inch = about 800 feet, and a mosaic map prepared consisting of 40 sheets, each approximately 26 by 38 inches and each covering an area approximately 3.64 by 5.46 miles. The photographs were taken by the 101st Photo Section, 26th Division Air Service, Massachusetts National Guard.

Design of Structures

Shaft 1. Wachusett Outlet. — Studies were continued and designs made for the installation of gates to control the discharge from Quabbin Aqueduct into Wachusett Reservoir. Studies were made of the desirability of increasing the capacity of the electric hoist in the Wachusett outlet building from 5 to 7½ tons, for handling heavy equipment into and out of the deep dry well for unwatering the tunnel. A 7½-ton electric hoist was purchased and installed.

Shaft 8. — Studies and designs were made for a service building near the Ware River intake works. Studies were also made indicating the impracticability of any power development on the Ware River at the diversion dam.

Shaft 9. — Studies were completed for the requirements of an electric hoist to handle men and equipment in and out of the aqueduct at Shaft 9. The 5-ton hoist previously installed at Shaft 1 was found to be amply suited to this purpose and was installed in the head house at Shaft 9.

Shaft 12. — Designs were completed for stop shutters and lifters required for unwatering the tunnel and of one-way shutters to permit the drawing of water from Quabbin Reservoir into the tunnel or to prevent discharge into this reservoir of water diverted from the Ware River. These shutters and lifters were purchased. Studies were completed of the requirements of a 3-ton electric hoist operated by the 15-kilowatt, gasoline-driven generator in the service building, to handle these shutters, as well as men and other equipment in and out of the shaft. This hoist was purchased. Designs were made for grading and landscaping at the Swift River intake and service buildings at Shaft 12, in connection with an access road from a point in the existing highway extending westerly from Shaft 11A.

Shallow Flowage. — Studies were continued of the possibility of eliminating two areas of shallow flowage on the margins of Quabbin Reservoir by the construction of low dams to maintain the water level in such areas, when the main reservoir is drawn down.

Main Dam and Dike Embankments. — Studies were continued of the materials in the main dam and dike embankments as revealed by tests of samples taken periodically from the embankments, including samples from the observation wells in the interior of the impervious core, as a guide in the proper control of borrow pit materials used in the hydraulic sluicing.

Administration Buildings and Boathouse. — Studies were continued and designs completed for the permanent office and maintenance buildings near the site of the main dam. Studies and designs were made for a water supply system for these buildings, including a deep drilled well and motor-driven pump with a capacity of 30 gallons per minute against a head of 150 feet, located in the boathouse and hangar, and a 50,000 gallon underground concrete tank 27 feet in diameter and 17.5 feet in maximum depth, located about 80 feet above the main floor of the administration building.

Power Development at Main Dam. — Studies were continued of the requirements of hydroelectric power development at the outlet works downstream from the stream control tunnel at the main dam, and designs were continued for these outlet works.

Roads.—Studies were completed of substitute highways around Quabbin Reservoir.

Quinapoxet River Diversion. — Studies were continued relative to diverting into the aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

Diversion of Industrial Wastes.—Studies were continued of methods of diversion of objectionable wastes into the Rutland-Holden sewer constructed under Contract 39.

Maintenance of Records

Photographic Records.—The taking of moving pictures from time to time to illustrate the progress of the work was continued.

Record Plans.—Progress was made on the preparation of record plans of the Ware River intake works and Quabbin Aqueduct. Record plans were completed and filed, with the Department of Public Works, of the state highway, 5.2 miles long, in the towns of Ware and Belchertown, constructed under Contract 21, and of those portions of the Daniel Shays Highway so-called, 9.1 miles long, in the towns of Belchertown and Pelham, constructed under Contract 41, and 7.6 miles long, in the towns of Shutesbury and New Salem, constructed under Contract 43.

Cemetery Records.—Records of assignment of lots and interments in Quabbin Park Cemetery and of the general removal of bodies from existing cemeteries in the reservoir area were maintained.

Cost Records.—Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements.

Inventories.—Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

QUABBIN RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division, continued in charge of the work on the Ware River watershed, of the maintenance of the Rutland-Holden sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, of the construction of the East Branch Baffle, the buildings at the tops of Shafts 9 and 12 and of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, and of the construction of the main dam and dike embankment, relocated highways, and the group of administration buildings at the main dam.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 50, 52 and 55, monthly estimates for Contracts 49, 51, 56 and 57, and final estimates for Contracts 38, 49, 51, 53, 54, 55, 57 and 59 were prepared. Additional real estate plans were prepared of miscellaneous properties in the Ware River watershed, final tracings being made of about 2,400 acres, making a total to date of about 6,750 acres. Record tracings of the plans showing the Ware River drainage divide were continued. A record topographic map was made of the vicinity of the Ware River intake works and work was continued on the making of topographic maps of miscellaneous swamp areas and ponds in the Ware River watershed and of other miscellaneous areas as required. Plans and studies were made of methods of disposing of sewage at various points in the Wachusett watershed and of making connections for the same into the Rutland-Holden sewer. Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield. Continuous records of the flow of the Swift River were kept at the main dam site. Work on the record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem was continued. Photographs of the progress of construction were taken.

Miscellaneous Field Work

Lines and grades were given for construction under Contracts 47, 50, 51, 52, 55, 56, 57 and 59. Daily readings of the ground water level in numerous test wells were continued during construction operations at the main dam and dike. Morton Pond was used to supply the make-up lines for the sluicing operations at the dike until September 30, 1936. About January 8 the water level of Morton Pond at elevation 434.8 stood 17.8 feet above the original surface and the flow commenced northerly into the Swift River. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

Quabbin Aqueduct and Ware River Intake Works

A new 7½-ton electric Monorail hoist, with a lift of 240 feet, was installed March 2 in the Wachusett outlet works at Shaft 1 to replace a 5-ton hoist of similar lift which was moved to the Shaft 9 head house and erected there April 17. A 3-ton electric hoist, with a lift of 140 feet, was installed in the Shaft 12 head house April 15.

The Ware River intake works were maintained ready for operation whenever required. The tunnel was entered for inspection through Shaft 8 on October 7.

Operation of Rutland-Holden Sewer

The Rutland-Holden sewer was in continuous operation. The meter stations at the Rutland State Sanatorium, at the U. S. Veterans Hospital in Rutland and at the Holden-Worcester boundary line were inspected regularly and weirs and piezometer connections cleaned and records of flow maintained. Starting April 14, monthly inspections were made by traversing the entire length of the line and inspecting the embankment structures, manhole covers, locks, etc. Necessary repairs were made.

Ware River Watershed

Maintenance.—A small labor force was employed throughout the year in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 and Shaft 9 head houses, setting stone bounds, filling cellar holes, grading and cleaning up at the sites of buildings removed from the Ware River watershed, reforestation and other miscellaneous work. The average number of men so employed was 9, the maximum being 24 during the week ending May 29.

Reforestation.—Reforestation in the Ware watershed was continued. Planting of transplants from the Commission's nurseries in the Swift River valley and from swampy areas within the flow line of the proposed Quabbin Reservoir was started April 21 and completed May 28. A total of about 280,000 4-year white pine and Norway spruce transplants and 1,400 black spruce and larch from swampy areas was planted in the general vicinity of Coldbrook and along the river upstream from the intake works.

Fire Protection.—Forest fire fighting equipment was housed in a building of the Commission near the intake works and was maintained in readiness for service at all times. The equipment and personnel responded during the year for one forest fire on land of the Commonwealth within the Ware River watershed, which burned over an area of less than one-quarter acre.

Quabbin Reservoir

Topography.—Taking of topography in the area below the flow line of the reservoir was continued. To date, 32,149 acres of 50.2 square miles have been surveyed for the general topographic maps within and adjacent to the proposed reservoir, including the location of the entire flow line. A small labor force was employed in connection with this work.

Real Estate.—Properties described in applications by owners for sale of real estate were located and when no surveys had been made sketches showing the approximate location were prepared. Comprehensive real estate surveys and analyses and descriptions of deeds were continued. Real estate surveys during the year cover 4,522 acres, making a total to date of 68,786 acres or 107.5 square miles. Of this total, 68,000 acres have been plotted on a scale of 1 inch = 200 feet.

Photography.—The photographing of buildings, cemetery lots and construction was continued. During the year 63 photographs of buildings, 769 photographs of miscellaneous views and of the progress of construction at Quabbin Reservoir and elsewhere, and 134 photographs of property in the Ware River watershed were taken.

Cemetery Removals.—Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. During the year work progressed as shown in the following table:

CEMETERY REMOVALS

		To Nov. 30, 1936*	Year Ending Nov. 30, 1937	Total
Burial lots in Quabbin Park Cemetery assigned in exchange		423	142	565
Burial lots in Quabbin Park Cemetery sold		22	6	28
Number of releases executed of rights in old lots in Quabbin Reservoir area	to Q. P. Cemetery	386	142	528
	to other cemeteries	238	25	263
Bodies removed from Quabbin Reservoir area	to Q. P. Cemetery	2181	1522	3703
	to other cemeteries	845	76	921
Bodies moved from area outside Quabbin Reservoir to Quabbin Park Cemetery		3	—	3
Burials, not reinterments, in Q. P. Cemetery . . .		89	28	117
Headstones moved	to Q. P. Cemetery	1252	885	2137
	to other cemeteries	407	23	430
Monuments moved	to Q. P. Cemetery	216	81	297
	to other cemeteries	139	9	148

*Includes corrections of previously reported data. Quabbin Park Cemetery was not completed for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

On July 30 a taking of Woodlawn Cemetery, Cemetery Hill Cemetery and Church Cemetery in Enfield, and on October 6 a taking of Greenwich Cemetery in Greenwich, was made.

The vault was maintained and used from time to time during the winter months. Work of developing Quabbin Park Cemetery was continued by grading and seeding miscellaneous areas outside the established lots and by miscellaneous clearing. Cemetery lots were graded and seeded as removals were completed and in the case of purchases were graded and seeded at once. The average force employed on cemetery work during the working season of about 35 weeks was 21 men, the maximum being 28 during the week ending September 25.

Fire Protection.—The fire-fighting equipment was maintained in readiness for service at all times. Assistants in the division office were reappointed as deputy forest wardens in the towns affected by the reservoir. The equipment and personnel responded during the year to calls for assistance at 9 forest fires which burned over a total area of about 246 acres. There also occured a total of 12 fires in buildings, 7 of which were chimney fires resulting in little if any damage. A small labor force was employed to maintain a fire patrol throughout the year.

Lumbering.—Various lumbermen continued cutting operations under agreements with the Commission for the purchase of standing timber. In addition, miscellaneous small lots of standing timber have been sold and cut under the general supervision of this division.

Reforestation.—The general program of reforestation was continued with stock from the Commission's nurseries. Planting of 4-year-old white pine and red pine transplants was started April 23, and completed May 11, on approximately 200 acres of the middle and lower portions of the "Prescott Peninsula," and was confined to open areas requiring no clearing. A total of about 241,000 white pine and 53,000 red pine transplants were planted in addition to stock transferred to and planted in the Ware River watershed, as hereinbefore mentioned.

The entire stock was removed from the Twible Farm Nursery and from the Smith Farm Nursery during the spring, for planting on the watersheds of Quabbin Reservoir and the Ware River and these nurseries were discontinued. This stock consisted of about 480,000 4-year white pine, 42,000 4-year Norway spruce and 53,000 4-year red pine transplants.

General maintenance work was done in the Thurston Farm Nursery. At the end of the growing season it was estimated that the following number of seedlings and transplants were growing in the beds in this nursery:

	Number of 2-year Seedlings	Number of 4-year Transplants
White Pine	1,750,000	190,000
Red Pine	1,900,000	270,000
White Spruce	370,000	12,000
Red Spruce	300,000	8,000
Norway Spruce	350,000	40,000
European Larch	200,000	....
Hemlock	130,000	....
	5,000,000	520,000

General maintenance work was done in the Commission's permanent nursery in Belchertown, located above the future flow line of the reservoir near the main dam. The nursery work in this location consisted of plowing and harrowing and grading seed bed areas, constructing seed bed frames, planting, fertilizing, weeding, watering, applying of chemicals for the control of damping-off disease, and mulching and covering of seed beds for the winter. There are now 138 seed beds, 150 feet long by 4 feet wide, in this nursery. In addition, about 20 acres were prepared to receive the seedlings from the Thurston Nursery by harrowing, planting buckwheat, plowing under, harrowing and replanting. The following quantities of seed were planted both in the spring and in the fall, the latter being experimental, and it is estimated that the number of 1-year seedlings now growing in the seed beds in this nursery is as follows:

	Pounds of Seed in Spring	Pounds of Seed in Fall	Number of Seedlings
White Pine	60	15	1,100,000
Red Pine	55	20	1,200,000
White Spruce	13	7	600,000
Red Spruce	15	5	600,000
Norway Spruce	15	5	500,000
European Larch	35	15	500,000
Hemlock			15,000
	193	67	4,515,000

Work was continued on the collecting from the reservoir area and the transplanting in the Belchertown nursery of hemlock, Norway spruce, ground juniper, azalea, red pine, mountain laurel and other shrubs and conifers. About 8,600 of such plants and shrubs are now on hand.

Gypsy moth control adjacent to areas planted to pine was continued. This work included the cutting of apple, gray birch and other species which are hosts of the gypsy moth, and creosoting of gypsy moth egg clusters. White pine blister and rust control was continued.

A labor force of about 12 was employed for about 40 weeks during the season of work in the nursery, on broad planting, gypsy moth and blister rust control and other reforestation work.

Clearing Project.—The work of clearing areas to be flooded by Quabbin Reservoir, which was started about May 1, 1936, as an unemployment relief project, was continued to completion on January 22. The tools and small equipment used on this project were then stored in the storehouse formerly occupied by the Haskell store in Enfield village. The number of men on the work averaged about 640 for the 8 weeks ending January 22, and was decreased from 938 to 279 before the work ended.

Maintenance.—A labor force was employed throughout the year in cleaning up debris from buildings removed and filling cellar holes, burning brush left by the clearing project and by lumber operations, cutting a 40-foot fire lane around the proposed real estate taking line, recutting and burning brush which had grown up in areas cleared as a fire stop along the flow line in 1935, and miscellaneous work of maintenance. The average number of men so employed was 33, the maximum being 69 for the week ending March 27.

Soil Testing Laboratory.—The work of exploring, collecting and testing materials to be used in the construction of the main dam and dike, together with current control tests of the quality of the material placed in these structures, was continued. New equipment was added to the laboratory from time to time as testing methods were expanded. Tests were principally of the permeability, stability and related characteristics of soils affecting their use in hydraulic-fill and rolled-fill embankments. Use of the plasticity needle was continued. Samples from selected borrow areas were collected as required for preliminary testing to determine their suitability for use in the embankments.

Size distribution analyses supplemented by tests of permeability, density and moisture content were used in the control of materials placed in the rolled pervious and impervious fills used to top off the dike embankment.

Size distribution analyses supplemented by permeability and porosity tests were used for the routine control of the quality of the beach and core materials placed by the full-hydraulic method in the construction of the main dam embankment. Fins of unsuitable material projecting into the core were jetted. Samples were collected daily from the dry-box hopper for sizing tests. The water in the central pool was examined daily for turbidity. Samples from the settled core were obtained periodically through the ports of the two observation wells and tested for size gradation and porosity to determine the extent of consolidation. Methods and equipment were developed to test 100 samples per day for grain-size distribution, in order to keep pace with the sampling schedule used in the construction of the main dam hydraulic embankment.

Grading and moisture tests were made of concrete aggregates and slump tests were made on concrete samples. Miscellaneous testing included materials used in the embankment of the East Branch Baffle in Greenwich. During the year, 9,862 samples were collected, and 10,653 samples, including some collected during the previous year, were tested. A small labor force was employed in the collecting and handling of samples.

Chemical and Bacteriological Laboratory.—The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued.

Regular samples have been collected and sampled from stations on the Ware, Swift, Quaboag and Chicopee rivers. Supervision of the water supplies for the reservoir clearing project was continued until the completion of this project. Samples were taken to determine the quality of water to be supplied from the deep well sunk under Contract 59 for the group of administration buildings at the main dam. In connection with the comprehensive sanitary survey of the watersheds of the Metropolitan District, under Chapter 48 of the Resolves of 1936, a program of sampling the rivers and their tributaries in the Wachusett and Sudbury watersheds was carried on. Fifty-seven sampling stations were established for this purpose and on several of the more important tributaries weirs were installed and the flow recorded at the time of sampling. A small labor force was employed in the collecting and handling of samples.

Progress of Contracts

Contract 38.—Contract 38, with The Two Companies, Inc., for constructing a core wall to sound rock at the site of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware, was completed January 9.

The value of work included in contract estimates during the year was $38,854.65, the final estimate dated August 5 being for $1,606,629.88.

Contract 47.—Contract 47, with Vincent Caira, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich, was continued. At the beginning of the year the work was about 80 per cent completed. The contractor continued through the winter to March 3 and resumed operations the second week in April. At the end of the year work on this contract was practically completed.

The value of work included in contract estimates during the year was $7,522.85, or a total to August 2, the date of the latest estimate, of $34,640.10, of which 90 per cent was approved for payment. The contractor's force averaged 3 men over a period of 20 weeks, the maximum being 10 for the week ending December 12, 1936.

Contract 49.—Contract 49, with Cenedella & Co., for excavating diversion channels at the site of Quabbin Reservoir in the towns of Dana, Hardwick and Greenwich, was completed July 22.

The value of work included in contract estimates during the year was $2,591.68, or a total to June 11, the date of the latest estimate, of $87,358.00, of which $84,789.69 was approved for payment. Following completion of the work a final estimate was prepared but settlement has not yet been made.

Contract 50.—Contract 50, with the Arthur A. Johnson Corporation, for constructing the embankment of the dike of Quabbin Reservoir in the towns of Enfield and Ware, was continued and at the end of the year was practically completed except for cleaning up the borrow pits. The rolled fill topping off the embankment was discontinued from December 3 to April 7, on account of frost, and was completed May 15.

During the winter months the work of placing the light and heavy riprap was carried on. About 30,000 cubic yards of light riprap and 20,000 cubic yards of heavy riprap were placed. All the riprap was secured from the borrow pits where the stones had been set aside during the previous excavations for the material for the hydraulic fill. The downstream face of the embankment and highway slopes were graded, covered with 6 inches to one foot of topsoil and seeded. Gravel sub-base was placed on the roadway at the top of the embankment and in the east and west access roads. These roads were surfaced with rolled trap rock and bound with bituminous materials. Cable and boulder guard rail was placed along the access roads. Paved grouted gutters were constructed where needed along the access roads and a paved grouted curb was built along the roadway on top of the embankment. Stone walls laid in mortar were built on both sides of the roadway on top of the embankment and around both of the access circles at the ends.

The drainage system consisting of tile pipes and catch basins was completed. The 3-foot vertical steel-cylinder shaft with observation ports above caisson 13 was brought to about 15 feet below the top of the embankment into a concrete chamber which extends up to a manhole cover on the north side of the road. Two large boulder monuments were placed at the center of the east and west access circles. Work on this contract was practically completed at the end of the year.

The value of work included in contract estimates during the year was $208,353.71, or a total to November 15, the date of the latest estimate, of $1,373,002.41, of which $1,360,702.17 has been approved for payment. The contractor's force averaged 57 men throughout the year, the maximum being 123 for the week ending December 5, 1936.

The total electric energy used by the contractor during the year was 112,500 kilowatt hours, making a total of 4,722,600 kilowatt hours to date.

The only important items of plant added during the year were one stone spreader and one 10-ton gasoline roller.

The total work done and the materials furnished to date under the principal items of Contract 50 are as follows:

Clearing and grubbing	136	acres
Earth excavation	74,000	cu. yds.
Rock excavation for core walls	8,200	" "
Rock excavation except for core wall	3,250	" "
Consolidated pervious foundation embankment	176,500	" "
Rolled impervious embankment in core	49,950	" "
Rolled impervious embankment except in core	75,070	" "
Embankment by full-hydraulic method	2,024,000	" "
Miscellaneous embankment	33,000	" "
Selected coarse material	71,160	" "
Crushed stone or screened gravel	21,800	" "
Light riprap	85,500	" "
Heavy riprap	20,400	" "

Dike of Quabbin Reservoir

Length, 2140 feet.
Maximum height above ground, 135 feet.
Maximum height above rock, 264 feet.
Width of top, 35 feet.
Maximum thickness at base, 850 feet.
Maximum depth of water, 115 feet.
Embankment 2,500,000 cubic yards.
Completed December, 1937.

Contract 50—Downstream Face Looking Northerly from East Access Road.

Contract 50—Roadway Across Top Looking Westerly from East End.

Paving	780 " "
Soil dressing	38,000 " "
Seeding and grassing	29 acres
Gravel sub-base for roads	4,600 cu. yds.
Broken stone base for roads	1,820 " "
Broken stone surface for roads	2,880 tons
Bituminous material	39,290 gallons
Cable guard rail	1,950 lin. ft.
Boulder guard rail	1,350 " "
Stone walls	1,090 cu. yds.
Furnishing and placing grout	635 " "
Portland cement	11,070 bbls
Concrete, Class A	4,830 cu. yds.
Concrete, Class B	15 " "
Miscellaneous steel and iron	58,800 lbs.
12-inch, 18-inch and 24-inch tile pipe	5,220 lin. ft.

Contract 51.—Contract 51, with Franklin A. Snow Company, for constructing the East Branch Baffle across the East Branch of Quabbin Reservoir in the towns of Greenwich and Hardwick, was continued to completion. Work was continued on the placing of the upper 6 feet of pervious fill, which was completed February 15. The pervious material was spread by bulldozers, watered by hose lines and consolidated by tractor-drawn sheep's foot rollers. The screening plant for screened gravel was operated until January 12. The placing of screened gravel on the pervious fill was completed February 13. Riprap was dumped from trucks. Quarry operations for the riprap were continued until February 15. Concrete work in the control chamber of the conduit through the baffle was completed December 20, 1936.

The auxiliary south baffle was completed in a manner similar to that described above, placing of pervious fill being completed December 29, screened gravel January 4, and riprap February 2. All work was shut down February 20 and resumed April 26. The Hardwick-Greenwich road relocated during the previous year was regraded and completed between April 26 and May 3. The entire construction work was completed June 11.

The value of work included in contract estimates during the year was $34,634.48, the final estimate dated July 21, being for $199,045.99. $9,500.00 of this amount is holding pending the outcome of contractor's petition. The contractor's force averaged 22 men over a period of 26 weeks and the maximum was 76 for the two weeks ending February 13.

No important items of plant were added during the year.

The total work done and materials furnished under the principal items of Contract 51 are as follows:

Earth excavation	40,173 cu. yds.
Pervious embankment	412,130 " "
Impervious embankment	8.585 " "
Stone fill	8,936 " "
Riprap	39,757 " "
Screened gravel	28,415 " "
Concrete	902 " "
Portland cement	1,784 bbls.

Contract 52.—Contract 52, with Benjamin Foster Company, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware, was continued throughout the year. In the concrete blanket on the east abutment, poured last year, the contractor drilled grout holes in February and in April grouted them and drilled and grouted the test holes, completing this abutment on April 28, 63 cubic yards of grout being placed. Work on the west abutment was resumed April 5 and drilling and grouting started in the lower portion. Starting May 14, the concrete blanket was extended up the abutment. The mixer was moved to progressively higher positions along the upstream side of the cut, and timber trestles built, over which the concrete was transported to the forms in buggies. The blanket was completed on August 30, 1657 cubic yards being placed this year, making a total of 2469 cubic yards. Grouting of this abutment was completed October 5, 860 cubic yards being placed.

The construction and grading of the beaches in preparation for the hydraulic fill was suspended for the winter on December 2, and completed the latter part of April. A total of 17,500 cubic yards was placed in the foundation beaches under this contract. In April the lower sections of two steel observation wells similar to the one built in the dike under Contract 50 were concreted into the center wells of caissons 7 and 20, and a sampling port was drilled through the concrete in the upstream face of caisson 7.

The core pool was filled and the pump barge floated at elevation 412 on May 15. Placing of the hydraulic fill was started May 19. The pool level was maintained by a battery of 4 make-up pumps, 60 to 200 horsepower, located on the river upstream from the dam and discharging through a 16-inch water line into a floating stilling box close to the west abutment. On the pump barge a battery of four 12-inch, 350 horsepower pumps pumped water from the pool through a 28-inch pipe to a hog box at about elevation 645 on the top of the hill at the east abutment. In the hog box the water from the pool and the dry-fill material, coming by conveyor from the borrow pits as hereinafter described, were mixed and flowed by gravity through the sluice pipes to the outer edges of the upstream and downstream beaches. The point of discharge from the pipe was varied by adding or removing lengths of pipe so that each beach was built up successively over its whole length. The coarse material was deposited nearest the pipe and the finer materials carried further down the beach by the water while the finest or core material was carried into the pool in suspension and was there settled out.

A 1-cu. yd. dragline on each beach shaped up the outside slopes of the fill as the material was deposited and made the blanket of selected coarse material required on the upstream face by picking up the coarser materials at the end of the sluice pipe. These draglines were also used in adding and taking off lengths of sluice pipe.

The method of construction at the main dam differed from that at the dike in two important respects: (1) Thin steel sluicing pipes lined with rubber one-half inch thick were used instead of ordinary steel pipes. These pipes were 20 inches in diameter and were furnished in 5, 10 and 20-foot lengths. They were joined together by flanges slotted for convenience in bolting, and faced with rubber continuous with the pipe lining. This pipe was designed for long life as compared with plain steel pipe. (2) Eight belt conveyors were used instead of trucks to carry material from the borrow-pit cuts to the hog box.

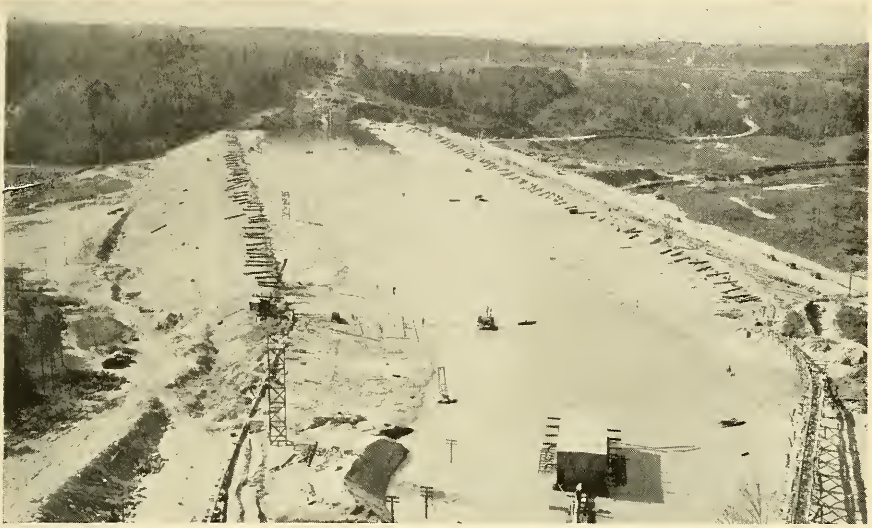
The original plan was to use sluice lines of the rubber-lined pipe with windows spaced about 25 feet apart for distributing the material the length of the beach without dismantling the pipe. This did not work out satisfactorily and the use of windows was abandoned, and the material distributed by successively adding or taking off pipe. It was also the original intention to deliver on both beaches at once but it was found that except under unusual circumstances one pipe would carry the capacity of the main belt conveyor, and the beaches were built alternately.

The operations were carried on during May with one shift, and after June 1 with 3 shifts, and 6 days a week except for necessary shutdowns for repairs.

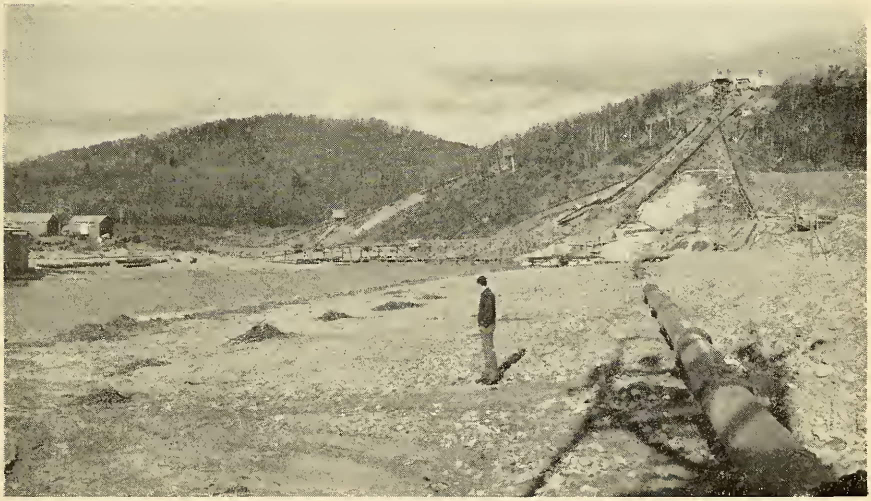
Material for the hydraulic fill was obtained principally from a low-level borrow pit upstream from the dam east of the river in the vicinity of the old highway, supplemented as required by material with a higher percentage of fines from a higher pit further east. A dry box was constructed between these two pits at the foot of the hill forming the east abutment of the dam. The main conveyor running up hill from the dry box to the hog box consisted of 3 sections of 42-inch belt with a 150-horsepower motor on each and a total length of 855 feet. At first only this main conveyor and dry box at its lower end were used. Boulders were rejected at the dry box and trucked to stock piles for future use as riprap. Stones larger than about 6 inches which passed through the dry box were picked off the belt conveyor by hand. Operations in the lower borrow pit by tractor drawn scrapers discharging into the dry box continued until January 24 when a belt conveyor 36 inches wide and 600 feet long was placed in operation extending northerly from the dry box and on July 31 this belt was fed at its northerly end, by a 36-inch movable radial belt conveyor, 700 feet long, with a 75-horsepower motor. This movable conveyor was built on short sections of trestle mounted on skids and located in a deep cut made in the westerly portion of the borrow pit. This conveyor was moved, with a shutdown of about an hour, by successively pushing the individual sections with a bull-

Main Dam of Quabbin Reservoir

Length, 2640 feet.	Maximum thickness at base about 1000 feet.
Maximum height above ground, 170 feet.	Maximum depth of water, 150 feet.
Maximum height above rock, 295 feet.	Embankment 4,000,000 cubic yards.



Contract 52—Looking Along Center Line of Main Dam Embankment Under Construction by Hydraulic Sluicing, Central Pool at Elevation 465, One-half the Future 170-foot Height.



Contract 52—East Abutment Showing Belt Conveyor to Hog Box on Hill at Elevation 645, and Sluice Lines to Beaches. Batter Boards Indicate Ultimate Top of Dam at Elevation 550.

dozer. This belt was normally fed by two 2-cu. yd. diesel shovels working along the west face of the pit which was about 40 feet high. These shovels dumped into hoppers which were moved on tracks along the conveyor line, keeping up with shovels moving along the face of the cut. In addition, starting October 4, excavation was also made from the lower borrow pit by 6 tractor-drawn scrapers, from 5 to 10 cubic yards in capacity, which fed a 36-inch belt conveyor 500 feet long with a 100-horsepower motor, and emptying on to the main conveyor system at the central dry box. Material from the high-level borrow pit was excavated by the 2 shovels and trucked to the dry box.

During the first two weeks of October the movable conveyor in the lower pit was shut down and the shovels moved to the higher pit in order to obtain a larger percentage of fines. On November 11 the contractor started to move his conveyor lines into the upper pit in preparation for next season.

To remedy occasional coarse intrusions in the core, jetting was started July 1 and was carried on as required until the end of the year. The jetting rig consisted of a gasoline-driven pump, 500 gallons per minute capacity, mounted on a float. It took water from the surface of the pool and forced it through a 2-inch jet pipe which was suspended from a head frame on the float. This jet pipe was lowered into the core at the desired location and there moved up and down agitating and mixing the core material.

On working days after June 1 there were placed an average of about 14,000 cubic yards per day, the maximum being about 22,700 on August 12, and the hours of plant operation per day averaging 21.

Operations were shut down for the winter on November 11, after 1,964,700 cubic yards of hydraulic fill had been placed, including 67,300 cubic yards of selected coarse material for the upstream face.

Starting September 25, coarse aggregate from the aggregate plant was placed on the upstream face of the dam in a layer 12 inches thick as a foundation for the riprap. At the end of the year 2,600 cubic yards had been placed.

Cobbles and boulders from the borrow which were rejected at the dry box or picked from the belts were stocked and later delivered by trucks and placed as light riprap on the upstream face of the dam. Where possible, the material was dumped from the berm directly into place but the greater part of it was placed by backing the truck down the slope and dumping the riprap above that previously placed, the truck being pulled back by a caterpillar tractor. Approximately 6,500 cubic yards have been placed on the upstream face of the dam. A considerable quantity of such rejected boulders was trucked to the upstream beach and thus incorporated in the pervious embankment of the dam.

Work was in progress on the continuation of the drainage system at the downstream toe of the dam. Work was also in progress on the intake structure extending up through the embankment from the stream control tunnel at the point where this tunnel will later be plugged. From September 4 to October 22 the concrete was carried up to elevation 496.5. The concrete was mixed in a paving mixer on the steep hillside and placed at first by chuting and later by buggies on trestles. From September 29 to November 18 the intermediate intake conduit was constructed, extending horizontally on the hydraulic fill from the intake shaft to the opening on the upstream face from which water may be drawn between elevations 465.0 and 473.0. To place this concrete the mixer was located on the embankment alongside the conduit and concrete was placed by buggies. The intermediate intake was completed except wing walls. In August all but about 40 feet of the 72-inch steel pipe to be laid in the stream control tunnel between the intake and outlet works was delivered and stored.

At the beginning of the year the contractor started excavation of the spillway site in the natural depression east of the dam. Peat was taken out and wasted in an area about 700 feet downstream from the dam on the west side of the old river channel. Suitable material from the spillway excavation was used in the fills for the east access road. About 71,000 cubic yards of earth were removed including cuts required for the access road near the site of the bridge over the spillway channel, and about 5,500 cubic yards of rock were excavated to provide drainage at the north end.

The concrete cut-off wall across the auxiliary spillway channel west of the dam was continued to completion December 12, 1936, except for granite cap stones, and at the same time a reinforced concrete septic tank to be later connected with the future administration buildings was built downstream from the cut-off wall.

A reinforced concrete water tank for the water supply of the future administration buildings was built on the hill at the west end of the dam. This tank is 27 feet inside diameter by 17.5 feet maximum inside height, with a capacity of 50,000 gallons and a maximum flow line about 80 feet above the main floor of the administration buildings.

In order to obtain a water supply for his own use, the contractor sank a drilled well 342 feet deep in the vicinity of his office.

The value of work included in contract estimates during the year was $853,652.00, or a total to November 15, the date of the latest estimate, of $913,991.00, of which 90 per cent was approved for payment. The contractor's force averaged about 110 men during the first half of the year, and about 310 during the last half of the year, when the hydraulic fill was being placed, the maximum being 399 for the week ending October 23. Camp facilities have not been provided at the work.

The total electric energy used by the contractor during the year was 3,745,800 kilowatt hours, making a total of 3,764,300 kilowatt hours to date.

In addition to the conveyor and sluicing plant for the hydraulic fill already described, the following important items of plant were added during the year:

4 Diesel shovels, 2-cu. yd. capacity
2 Diesel draglines, 1-cu. yd. capacity
1 Diesel crane
14 Caterpillar tractors (4 with bulldozer equipment)
2 8-cu. yd. bottom-dump trucks
8 10-cu. yd. bottom-dump wagons
5 10-cu. yd. scraper wagons
1 5-cu. yd. scraper wagon
1 Double-section sheep's-foot roller
2 5-cu. yd. trucks (in addition to rented trucks)
Miscellaneous smaller trucks, concreting equipment, pumps, drills, etc.

The total work done and materials furnished to date under the principal items of Contract 52 are as follows:

Earth excavation	101,500	cu. yds.
Rock excavation	13,860	" "
Consolidated pervious embankment	17,600	" "
Rolled impervious embankment	1,900	" "
Embankment by full-hydraulic method	1,897,400	" "
Miscellaneous embankment	80,000	" "
Selected coarse material	67,300	" "
Crushed stone or screened gravel	3,100	" "
Light riprap	7,200	" "
Heavy riprap	540	" "
Furnishing and placing grout	925	" "
Portland cement	7,000	bbls.
Concrete, Class A	3,355	cu. yds.
Concrete, Class B	1,080	" "
Reinforcing steel	55,000	pounds

Contract 53.—Contract 53, with The English Construction Company, for constructing the head house at Shaft 9 of Quabbin Aqueduct, was completed June 9.

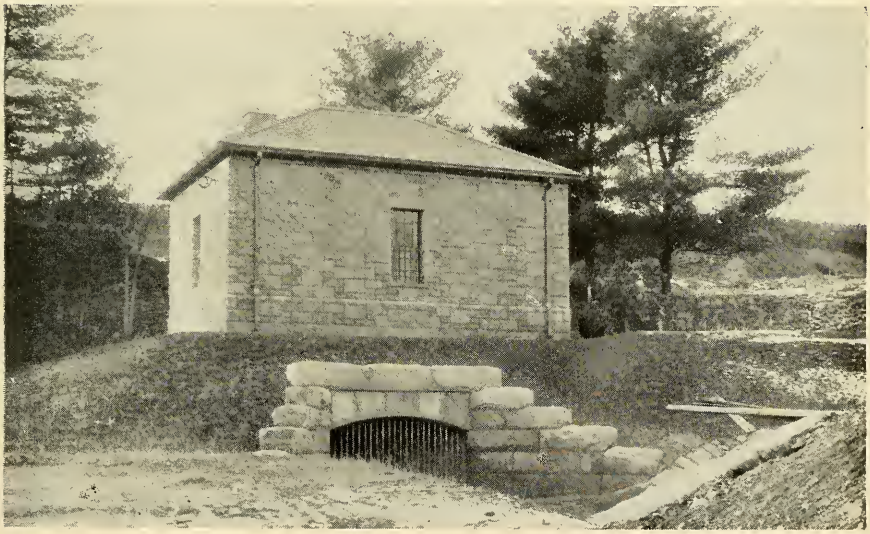
The value of work included in contract estimates during the year was $1,209.00, or a total to January 15, the date of the latest estimate, of $9,021.00, of which 90 per cent has been approved for payment. Following completion of the work, a final estimate was prepared, but settlement has not yet been made.

Contract 54.—Contract 54, with Carlo Bianchi & Company, for the construction of 1.83 miles of road in the towns of Dana and Petersham, was completed on November 17, 1936.

The value of work included in contract estimates during the year was $1,184.28, the final estimate dated December 7, 1936, being for $63,840.60.

Contract 55.—Contract 55, with Arute Bros., Incorporated, for the construction of 4.34 miles of state highway in the Town of Petersham, was completed July 19. Work during the year consisted of completing the cable guard rail, grading and miscellaneous cleaning up.

Contract 51—East Branch Baffle in Greenwich, Looking East.



Contract 53—Easterly Side of Head House, Shaft 9 of Quabbin Aqueduct, Showing Vent From Tunnel 200 feet below.

The value of work included in contract estimates during the year was $30,914.06, the final estimate dated August 27, being for $239,156.65, of which $110,991.47, covering mainly surfacing items and guard rail, was assumed by the Department of Public Works.

Contract 56.—Bids were opened June 10, for constructing the administration buildings near the main dam of Quabbin Reservoir in the Town of Belchertown. Fourteen bids were received, ranging from $362,445.00 to $490,000.00. The contract was executed July 28 with Rich Bros. Construction Co., Inc., Boston, Mass., the lowest bidder. The work contracted for consists of constructing a three-story administration building facing the north, overlooking the reservoir, flanked on the east and west by two residences with garages on either side of a rear courtyard. It also includes a boathouse and hangar, located in front of and at a lower level than the main administration building and fronting directly on the margin of the reservoir.

Work started August 2 on the clearing of the site. Excavation for the buildings and pipe trenches was started August 12 and practically completed during the year. The first concrete was poured in the footings and walls of the west garage August 28. Sand and stone for concrete aggregates were trucked to the job. Brick and tile work was started September 20 in the west garage. Waterproofing was started September 24 with the application of mastic waterproofing to the outside of the foundation walls.

Setting of structural steel started September 29 in the west garage. Gypsum roof planking was started November 16. Laying of pipe in the surface drainage and sewage disposal system started October 1, and in the subsurface drainage system for the buildings, October 9. The laying of the water supply lines from the tank on the hill at the west end of the dam, constructed under Contract 52, was started September 3. At the end of the year work on the buildings had progressed as follows: Brick walls and tile backing were completed for the garages and residences, and were carried generally above the second floor level in the main building. Structural steel was practically completed in the garages and residences and for the first floor level of the main building. Gypsum roof planking was completed on the garages and partially complete on the east residence. About 650 feet of 12-inch vitrified tile pipe was completed in the main surface drainage. The 8-inch cast-iron sewer pipe leading to the septic tank, downstream from the emergency spillway wall built under Contract 52, was completed except for branch connections. The subsurface drainage system for the buildings was practically completed. The water supply pipe from the well sunk under Contract 59 to the concrete tank built under Contract 52 and connections were completed. Progress was made on the installation of a 5000-gallon fuel tank and two boilers in the basement of the main building.

The value of work included in contract estimates to November 10, the date of the latest estimate, was $93,428.12, of which 90 per cent was approved for payment. The contractor's force averaged 56 men for a period of 17 weeks, the maximum being 90 for the week ending November 20.

Contract 57.—Contract 57, with John Iafolla Construction Co., for the construction of 3.65 miles of state highway in the Town of New Salem, was continued and practically completed. The work of grading and drainage was continued to completion early in the year. Nine borrow pits were used along the line of the work. This highway, which is a continuation in Franklin County of the highway in Worcester County completed under Contract 55, is 30 feet wide and consists of a penolithic surface course 24 feet wide and 2 inches thick on a broken stone course 4 inches thick placed on a sub-base of gravel 12 inches thick. The penolithic wearing surface was penetrated with a light oil and then with asphalt cement heated to about 350° F. and applied at a pressure between 20 and 75 pounds per square inch and a rate of about 1.2 gallons per square yard of surface. The surface was then rolled, and intermediate aggregate that had previously been treated with oil was applied and the surface re-rolled. A seal coat of asphalt cement was applied at the rate of 0.4 gallons per square yard, treated with oiled fine aggregate and then rolled. Shoulders 5 feet wide were constructed in fills where guard rail was required. Berm ditches were constructed beyond the tops of cut slopes to divert surface water from these slopes and the slopes of all cuts and of some fills were loamed. The construction work was completed on September 29.

The value of the work of this contract as shown by the final estimate dated November 24, is $168,822.96. There has been paid the contractor $142,640.38, of which the Department of Public Works, for surfacing and guard rail, paid $60,231.34. Of the remainder to be paid, the Department of Public Works will pay $12,819.72. The contractor's force averaged 32 men for a period of 31 weeks, the maximum being 70 for the week ending June 26.

The only important items of plant added during the year were two stone spreaders.

The total work done and materials furnished under the principal items of Contract 57 are as follows:

Roadway earth excavation	68,405	cu. yds.
Ledge excavation	3,060	" "
Ordinary borrow	72,790	" "
Plain cement concrete masonry (1-2½-5)	160	" "
Reinforced cement concrete masonry (1-2-4)	105	" "
Broken stone for base course	11,465	ton
Side drains with 6-inch pipe	1,525	lin. ft.
Gravel borrow	25,240	cu. yds.
Highway guard rail	13,580	lin. ft.
Trench excavation	3,175	cu. yds.
Clearing and grubbing	35	acres
Loam borrow	10,765	cu. yds.
Loam berms	1,775	lin. ft.
Peat excavation	14,705	cu. yds.
Bituminous material	87,470	gals.
Oiled broken stone	7,565	tons

Contract 59.—Bids were opened March 18, for drilling a well for the water supply of the administration buildings in the Town of Belchertown. Three bids were received, ranging from $857.50 to $1,517.50. The contract was executed March 30 with the Wachusett Artesian Well Company, West Boylston, Mass., the lowest bidder. The work was completed on April 21. Twenty-two feet of 8-inch casing was sunk and sealed 1.5 feet into the ledge. Inside the 8-inch casing, 32 feet of 6-inch casing was sunk 10 feet further into the rock and the space between the two filled with grout. The well was sunk with a 6-inch bit to elevation 394.1, 150 feet below the ground surface. Upon completion, the well yielded 30 gallons per minute for 24 hours.

The amount of the final estimate dated April 22, was $691.28, all of which has been paid. The only labor employed was one drill runner and one helper.

LIST OF DRAWINGS AND TABLES APPENDED HERETO

Location of Real Estate Acquired for Quabbin Reservoir.

Takings of Real Estate and Water Rights.

Status of Contracts Completed between November 30, 1936 and November 30, 1937; and in Force on November 30, 1937.

Monthly Rainfall at Stations on Ware and Swift watersheds, 1937.

For data on contracts completed prior to November 30, 1936, see sixth to eleventh annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1937, see 1935 and 1936 annual reports.

Respectfully submitted,

FRANK E. WINSOR, *Chief Engineer.*

20 SOMERSET STREET, BOSTON, MASS.

January 3, 1938.

Quabbin Park Cemetery—Looking northerly Along Laurel Road

Contract 57—Looking Westerly along Petersham-New Salem Highway.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

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*EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION

New accounts have been opened during the year necessitating transfers from old accounts.

GENERAL OVERHEAD

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
ADMINISTRATION, *Commissioners' Office:*		
Salaries, Commissioners	$10,500.00	$117,415.56
Salaries, Clerical	15,198.78	127,548.67
General Legal Expense	00.00	2,169.16
Furniture and Fixtures	172.16	4,569.20
Engineering Instruments	00.00	98.00
Rent and Upkeep	2,417.81	25,300.64
Automobile Purchase	453.03	2,917.93
Automobile Maintenance	263.77	3,284.43
Miscellaneous Expense (undistributed)	2,156.35	17,202.30
Advertising	1,419.07	11,011.57
Printing and Blueprinting	955.31	10,697.50
Stationery and Office Supplies	461.12	3,063.24
Postage	161.00	1,627.05
Total Administration, Commissioners' Office	$34,158.40	$326,905.25
ENGINEERING, *Headquarters' Office:*		
Salaries, Engineering	$79,268.51	$865,665.37
Salaries, Clerical	12,533.64	106,799.13
General Consultant Expense	00.00	116,515.25
General Legal Expense	00.00	53,160.29
Furniture and Fixtures	56.50	15,119.44
Laboratory Equipment	00.00	1,961.00
Laboratory Supplies	00.00	2,071.94
Rental of Equipment	00.00	3,370.02
Engineering Instruments	73.50	1,258.04
Rent and Upkeep of Boston Office	11,127.44	116,053.26
Rent and Upkeep of Springfield Laboratory	00.00	3,950.54
Automobile Purchase	453.02	3,604.62
Automobile Maintenance	263.75	4,169.16
Special Experiments	00.00	2,304.63
Miscellaneous Expense (undistributed)	897.28	22,814.83
Printing and Blueprinting	1,303.09	16,155.39
Stationery and Office Supplies	541.83	6,363.71
Postage	261.00	2,341.48
Total Engineering, Headquarters' Office	$106,779.11	$1,343,678.10
UNASSIGNED:		
Unassigned Supplies and Equipment	-$421.15	$00.00*
Total General Overhead	$140,516.36	$1,670,583.35

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*Account closed upon recommendation of State Auditor's Office

Distribution of General Overhead

Administration, *Commissioners' Office:*

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Wachusett-Coldbrook Tunnel	$1,229.08	$78,404.30
Coldbrook-Swift Tunnel	583.64	29,751.01
Quabbin Reservoir	27,395.34	138,493.15
Main Dam	2,781.60	39,507.48
Beaver Brook Dike	959.64	28,116.49
Southern Sudbury Emergency Supply	00.00	8,690.28
Metropolitan System—General (Expenditures under Chapter No. 48)	1,209.10	2,433.76
Cochituate Supply (Expenditures under Chapter No. 18)	00.00	1,508.78
Total Administration Commissioners' Office	$34,158.40	$326,905.25

Engineering, *Headquarters' Office:*

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Wachusett-Coldbrook Tunnel	$3,470.13	$313,252.74
Coldbrook-Swift Tunnel	1,782.76	113,760.60
Quabbin Reservoir	74,782.94	619,741.92
Main Dam	11,470.69	140,531.55
Beaver Brook Dike	4,626.67	105,045.70
Southern Sudbury Emergency Supply	00.00	33,407.97
Metropolitan System-General (Expenditures under Chapter No. 48)	10,645.92	13,879.37
Cochituate Supply (Expenditures under Chapter No. 18)	00.00	4,058.25
Total Engineering, Headquarter's Office	$106,779.11	$1,343,678.10

Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct
Ware Supply

General Overhead:

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Administration, Commissioners' Office	$1,229.08	$78,404.30
Engineering, Headquarters' Office	3,470.13	313,252.74
Total General Overhead	$4,699.21	$391,657.04

Engineering:

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Salaries, Engineering and Clerical	$1,750.74	$398,503.59
Consultant Expense	325.01	7,974.87
Labor	162.50	4,037.33
Furniture and Fixtures	3.14	2,306.95
Engineering Instruments	118.02	7,697.24
Rent and Upkeep	969.27	18,721.32
Automobile Purchase	156.07	11,578.89
Automobile Maintenance	215.83	15,646.44
Contracts for Investigations and Surveys	00.00	18,640.69
Miscellaneous Expense (undistributed)	415.53	9,986.10
Advertising	00.00	6.05
Printing and Blueprinting	33.40	1,133.70
Stationery and Office Supplies	45.88	3,073.29
Postage	9.25	453.32
Total Engineering	$4,204.64	$499,759.78

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
REAL ESTATE—*General Construction:*		
Legal and Expert Expense	$18.43	$6,205.35
Consultant Expense	00.00	455.66
Labor	00.00	1,711.20
Miscellaneous Expense (undistributed)	00.00	1,003.60
Printing and Blueprinting	00.00	62.36
Purchases and Settlements	200.00	123,347.50
Taxes	00.00	3,682.24
Maintenance of Real Estate	00.00	1,298.18
Police Protection		
Labor	00.00	41.00
Fire Protection		
Equipment	00.00	1,254.66
Miscellaneous Expense	00.00	00.54
Special Agents		
Salaries	00.00	12,949.00
Furniture and Fixtures	00.00	117.67
Automobile Purchase	00.00	1,222.50
Automobile Maintenance	00.00	2,124.30
Miscellaneous Expense (undistributed)	00.00	1,201.73
Printing and Blueprinting	00.00	26.51
Stationery and Office Supplies	00.00	5.48
Postage	00.00	21.36
Total Real Estate	$218.43	$156,730.84
WARE WATERSHED PROTECTION:		
Salaries, Engineering and Clerical	$11,308.16	$136,144.88
Legal and Expert Expense	5,590.47	27,038.94
Consultant Expense	00.00	763.70
Labor	2,774.36	14,902.54
Engineering Instruments	28.99	407.10
Rent and Upkeep	200.42	414.61
Furniture and Fixtures	00.00	62.92
Completed Contracts Nos. 27 and 39	00.00	243,104.18
Automobile Purchase	96.08	1,242.53
Automobile Maintenance	841.64	5,472.80
Special Experiments	00.00	700.00
Compensation to Labor for Injuries	774.85	774.85
Medical and Surgical Supplies	200.00	200.00
Miscellaneous Expense (undistributed)	302.75	5,752.00
Printing and Blueprinting	102.28	726.84
Stationery and Office Supplies	92.09	374.85
Advertising	00.00	2.00
Postage	18.70	50.55
Installed Equipment	00.00	5,610.75
Rental of Equipment	2.50	2.50
Purchases and Settlements	136,166.99	1,340,983.81
Taxes	12,819.03	48,044.88
Maintenance of Real Estate	4,577.08	9,313.28
Purchase and Planting of Trees and Shrubbery	-720.00	00.00
Special Agents		
Salaries	2,460.00	9,648.67
Automobile Purchase	318.65	622.00
Automobile Maintenance	461.24	1,917.08
Miscellaneous Expense (undistributed)	371.56	1,210.26
Printing and Blueprinting	110.58	167.40
Stationery and Office Supplies	00.00	3.91
Postage	3.00	23.55

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Labor	15.00	15.00
Police Protection		
Labor	54.00	64.00
Fire Protection		
Equipment	00.00	39.09
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing		
State Sanatorium Branch	55.92	478.07
U. S. Vet. Hospital Branch	65.76	516.70
Trunk Sewer, except Branches	213.24	1,291.16
Use of City of Worcester's Sewerage System for disposal of Sewage from Rutland-Holden Sewer	759.32	775.10
Reforestation, Watershed Planting		
Trees for Watershed Planting	1,521.89	1,521.89
Total Ware Watershed Protection	$181,586.55	$1,860,384.39
WARE DIVERSION DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering and Clerical	-$2,109.74	$84,674.25
Legal and Expert Expense	5.32	3,177.15
Consultant Expense	-1,921.37	33,537.61
Labor	63.50	2,434.48
Furniture and Fixtures	00.97	30.73
Laboratory Equipment	6.90	280.11
Laboratory Supplies	56.73	433.44
Engineering Instruments	00.00	560.34
Rental of Equipment	00.00	203.75
Rent and Upkeep	39.44	44.19
Automobile Purchase	00.00	170.42
Automobile Maintenance	30.52	4,000.65
Contracts for Investigation and Surveys	00.00	63.27
Materials of Construction	00.00	136.51
Miscellaneous Expense (undistributed)	3.07	7,339.46
Printing and Blueprinting	3.91	1,261.10
Stationery and Office Supplies	00.05	64.10
Postage	00.00	6.62
Purchases and Settlements	30,108.33	196,633.33
Sub total Ware Diversion Damages—Except Awards by Court Decree	$26,287.63	$324,051.51
WARE DIVERSION DAMAGES—AWARDS BY COURT DECREE:		
JURY VERDICTS:		
Salaries, Engineering and Clerical	$5,183.45	$61,087.46
Legal Expense	-19,751.71	37,806.71
Consultant and Engineering Expert Expense	16,117.40	92,969.39
Expert and other Witness Expense	49,607.79	63,740.91
Automobile Maintenance	00.00	440.58
Miscellaneous Expense (undistributed)	948.96	7,526.44
Printing and Blueprinting	78.91	682.98
Stationery and Office Supplies	21.83	146.83
Postage	4.10	19.63
Settlements	00.00	260,000.00
Payments under Certificates of Judgment	53,018.50	560,458.62
Sub Total Ware Diversion Damages—Awards by Court Decree:—Jury Verdicts	$105,229.23	$1,084,879.55

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
WARE DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR REIMBURSEMENT FOR EXPENSES OF LITIGATION IN COUNTY COURTS:		
County of Hampshire	$15,000.00	$15,000.00
Total Ware Diversion Damages	$146,516.86	$1,423,931.06
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$00.00	$9,629,739.99
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Installed Equipment	$4,067.60	$63,066.43
Temporary Equipment	00.00	6,423.60
Labor	189.25	4,415.69
Compensation to Labor for Injuries	18.29	18.29
Contracts for Equipment for Surveys	00.00	898.34
Maintenance of Partially Completed Structures	1,719.79	11,574.60
Maintenance of Grounds	682.50	5,614.69
Purchases of Plants, Trees and Shrubbery	00.00	842.58
Rental of Equipment	00.00	7.00
Miscellaneous Expense	00.00	9,453.84
Materials of Construction	00.00	25.87
Total Permanent Construction—Except Construction Contracts	$6,677.43	$102,340.93
TOTAL WACHUSETT-COLDBROOK TUNNEL, WARE SUPPLY	$343,903.12	$14,064,544.03

WACHUSETT WATERSHED PROTECTION

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
ENGINEERING:		
Salaries, Engineering and Clerical	$1,536.46	$5,542.53
Legal Expense	00.00	3.55
Labor	265.24	700.24
Automobile Maintenance	54.95	200.18
Miscellaneous Expense (undistributed)	6.44	265.93
Printing and Blueprinting	00.00	19.91
Postage	2.10	5.95
TOTAL WACHUSETT WATERSHED PROTECTION	$1,865.19	$6,738.29

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$583.64	$29,751.01
Engineering, Headquarters' Office	1,782.76	113,760.60
Total General Overhead	$2,366.40	$143,511.61
ENGINEERING:		
Salaries, Engineering and Clerical	$7,199.76	$266,922.24
Consultant Expense	33.75	586.73
Labor	492.90	2,499.30
Furniture and Fixtures	12.50	1,567.40
Engineering Instruments	15.72	4,577.18
Rent and Upkeep	230.50	10,657.11
Rental of Equipment	00.00	3.00
Automobile Purchase	00.00	8,010.52
Automobile Maintenance	231.95	18,029.31

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Contracts for Investigations and Surveys	00.00	13,525.66
Materials of Construction	00.00	2.25
Miscellaneous Expense (undistributed)	114.04	8,069.82
Printing and Blueprinting	1.96	955.51
Stationery and Office Supplies	38.71	2,190.41
Postage	10.37	525.81
Total Engineering	$8,382.16	$338,122.25
REAL ESTATE:		
Legal and Expert Expense	$00.00	$3,103.53
Labor	00.00	12.20
Miscellaneous Expense (undistributed)	00.00	27.16
Printing and Blueprinting	00.00	34.87
Postage	00.00	5.68
Purchases and Settlements	00.00	23,610.00
Taxes	00.00	724.77
Maintenance of Real Estate	00.00	252.79
Fire Protection Equipment	00.00	60.86
Total Real Estate	$00.00	$27,831.86
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contract No. 20	$00.00	$4,809,852.83
Contract No. 53, Construction of Head House at Shaft 9	1,088.10	8,118.90
Total Contracts	$1,088.10	$4,817,971.73
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$4.00	$312.95
Installed Equipment	6,749.02	7,238.36
Water Supply System	00.00	3,417.56
Miscellaneous Expense	21.00	2,547.20
Total Permanent Constr. Except Constr. Contracts	$6,774.02	$13,516.07
COLDBROOK-SWIFT DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Purchases and Settlement	$2,800.00	$2,800.00
COLDBROOK-SWIFT DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Legal Expense	$42.00	$42.00
Total Coldbrook-Swift Damages	$2,842.00	$2,842.00
TOTAL COLDBROOK-SWIFT TUNNEL	$21,452.68	$5,343,795.52

QUABBIN RESERVOIR EXCEPT MAIN DAM AND DIKE

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$27,395.34	$138,493.15
Engineering, Headquarters' Office	74,782.94	619,741.92
Total General Overhead	$102,178.28	$758,235.07
ENGINEERING:		
Salaries, Engineering and Clerical	$69,249.10	$489,580.29
Consultant Expense	2,543.27	3,361.02
Labor	8,989.74	25,859.78

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Compensation to Labor for Injuries	6.86	6.86
Furniture and Fixtures	61.11	3,232.21
Laboratory Equipment	69.07	2,314.53
Laboratory Supplies	566.18	4,189.99
Rental of Equipment	00.00	16.75
Engineering Instruments	—217.99	6,311.91
Rent and Upkeep	2,883.66	13,460.65
Medical and surgical services	5.00	5.00
Automobile Purchase	1,305.62	21,982.96
Automobile Maintenance	5,309.55	24,167.55
Special Experiments	00.00	422.80
Contracts for Investigations and Surveys	00.00	14,683.87
Office Buildings	00.00	5,059.20
Miscellaneous Expense (undistributed)	1,997.93	8,750.88
Printing and Blueprinting	435.83	2,968.97
Stationery and Office Supplies	817.83	7,326.69
Postage	262.69	1,688.92
Total Engineering	$94,285.45	$635,390.83
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:		
Legal and Expert Expense	$8,519.71	$170,450.37
Consultant Expense	00.00	146.78
Labor	10,097.00	17,439.12
Compensation to Labor for Injuries	65.67	65.67
Furniture and Fixtures	00.00	46.06
Automobile Maintenance	252.64	359.08
Miscellaneous Expense (undistributed)	515.50	8,652.35
Advertising	00.00	208.66
Printing and Blueprinting	81.22	1,431.70
Stationery and Office Supplies	-00.45	00.00
Purchases and Settlements	102,820.70	6,534,649.88
Purchase price, B. & A. R.R. and N.Y.C. lessee, for part of Athol Branch and general release of all claims for damages for reservoir construction	66,240.88	641,240.88*
Taxes	54,444.48	396,360.30
Maintenance of Real Estate	1,575.70	9,938.08
Water Supply System	8.00	48.60
Fire Protection		
Equipmnet	782.40	5,622.00
Automobile Purchase	00.00	771.69
Automobile Maintenance	77.73	371.52
Labor	4,108.87	5,144.80
Compensation to Labor for Injuries	10.00	10.00
Miscellaneous Expense	36.38	257.76
Police Protection		
Labor	15.00	209.00
Special Agents		
Salaries	2,460.00	22,946.00
Equipment	00.00	118.33
Labor	30.00	30.00
Automobile Purchase	$318.65	$1,858.96
Automobile Maintenance	352.23	3,845.23

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*Includes interest on settlement of $575,000.00 which settlement was approved and scheduled by Commission on March 29, 1935, and shown in 1935 expenditures although payment was disapproved by Governor and Council and warrant returned to Comptroller's bureau. Rescheduled by Commission with interest on March 4, 1937, in accordance with judgment received from Superior Court, February 15, 1937.

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Miscellaneous Expense (undistributed)	121.61	1,555.93
Printing and Blueprinting	00.00	52.72
Stationery and Office Supplies	00.00	13.68
Postage	00.00	17.07
Renting Agents		
Salaries	2,820.00	26,528.10
Legal Expense	46.25	166.25
Furniture and Fixtures	00.00	29.29
Automobile Purchase	00.00	524.95
Automobile Maintenance	195.84	312.64
Labor	48.00	69.50
Miscellaneous Expense (undistributed)	44.85	933.86
Printing and Blueprinting	00.00	18.62
Stationery and Office Supplies	1.12	38.28
Postage	32.35	217.14
Payments to Towns	3,000.00	20,500.00
Sub Total Real Estate—Except Awards by Court Decree	$259,122.33	$7,873,200.85
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Salaries of Referees	$14,200.00	$21,140.00
Salaries, Engineering and Clerical	481.50	1,449.38
Legal Expense	6,528.29	11,351.82
Consultant and Engineering Expert Expense	1,923.10	2,545.50
Expert and other Witness Expense	3,210.00	7,720.07
Automobile Maintenance	6.53	6.53
Expenses of Board of Referees	214.00	764.30
Miscellaneous Expense	546.13	591.91
Printing and Blueprinting	21.99	21.99
Stationery and Office Supplies	23.72	23.72
Payments under Certificate of Judgment	179,041.67	179,041.67
Sub Total Real Estate—Board of Referees	$206,196.93	$224,656.89
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	$00.00	$27.73
Legal Expenses	00.00	557.90
Miscellaneous Expense	00.00	2.00
Payments under Certificates of Judgment	00.00	7,832.66
Sub Total Real Estate—Jury Verdicts	$00.00	$8,420.29
Total Real Estate	$465,319.26	$8,106,278.03
QUABBIN RESERVOIR DAMAGES:		
Salaries, Engineering	$00.00	$48.68
Legal and Expert Expense	00.00	931.00
Consultant Expense	00.00	2,158.82
Miscellaneous Expense (undistributed)	00.00	15.19
Printing and Blueprinting	00.00	2.96
Purchases and Settlements	66.00	48,341.00
Total Quabbin Reservoir Damages	$66.00	$51,497.65
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering and Clerical	$7,889.47	$86,140.01
Legal and Expert Expense	8.28	5,814.80
Consultant Expense	647.33	70,884.89

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Labor	571.25	1,535.10
Furniture and Fixtures	8.71	78.18
Laboratory Equipment	62.18	2,135.12
Laboratory Supplies	509.47	3,662.48
Engineering Instruments	00.00	762.98
Rent and Upkeep	370.38	413.03
Rental of Equipment	00.00	10.50
Automobile Purchase	00.00	1,533.72
Automobile Maintenance	740.10	4,234.36
Contracts for Investigations and Surveys	00.00	569.47
Materials of Construction	00.00	18.99
Miscellaneous Expense (undistributed)	34.55	6,189.82
Printing and Blueprinting	13.38	1,067.45
Stationery and Office Supplies	00.42	85.68
Purchases and Settlements	282,675.00	1,225,650.00
Sub Total Swift Diversion Damages—Except Jury Trial	$293,530.52	$1,410,786.58

BEAVER BROOK DIVERSION DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Salaries, Engineering and Clerical	$81.40	$488.90
Legal Expense	—6,350.00	3,303.27
Consultant and Engineering Expert Expense	00.00	2,815.05
Expert and other Witness Expense	6,350.00	6,350.00
Automobile Maintenance	00.00	104.94
Miscellaneous Expense (undistributed)	00.00	328.48
Printing and Blueprinting	00.00	22.18
Stationery and Office Supplies	00.00	19.55
Postage	00.00	1.00
Payments under Certificates of Judgment	00.00	9,985.53
Sub Total Swift Diversion Damages—Jury Trial	$81.40	$23,418.90
Total Swift Diversion Damages (including Beaver Brook)	$293,611.92	$1,434,205.48

QUABBIN RESERVOIR—CEMETERIES

QUABBIN PARK CEMETERY CONSTRUCTION:

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Salaries, Engineering and Clerical	$403.75	$12,352.27
Legal and Expert Expense	00.00	65.00
Consultant Expense	00.00	125.00
Labor	6,707.56	24,476.90
Tools and Equipment	104.81	472.27
Automobile Purchase	2,077.51	3,692.88
Automobile Maintenance	569.26	2,286.43
Rental of Equipment	00.00	33.19
Purchases and Settlements	00.00	8,850.00
Construction Materials	549.57	2,219.77
Purchase and Planting of Trees and Shrubbery	00.00	218.93
Receiving Vault	00.00	2,768.83
Water Supply System	00.00	1,251.97
Maintenance of Grounds	2,730.93	9,585.09
Miscellaneous Expense (undistributed)	950.65	1,184.08
Printing and Blueprinting	24.50	183.70
Stationery and Office Supplies	17.15	27.20

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Completed Contract No. 34	00.00	7,842.94
Compensation to Labor for Injuries	37.43	37.43
Sub Total Quabbin Park Cemetery Construction	$14,173.12	$77,673.90
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:		
Salaries, Engineering and Clerical	$2,766.25	$12,110.59
Tools and Equipment	37.49	504.29
Automobile Purchase	00.00	2,669.99
Automobile Maintenance	408.27	1,870.70
Removal and Reinterment of Bodies	6,663.94	20,221.06
Removal and Resetting of Monuments	3,940.89	12,608.27
Miscellaneous Expense	00.00	6.75
Rental of Equipment	00.00	10.50
Sub Total Removals to Quabbin Park Cemetery	$13,816.84	$50,002.15
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUABBIN PARK:		
Salaries, Engineering and Clerical	$287.50	$6,350.49
Tools and Equipment	15.43	15.43
Automobile Purchase	00.00	380.00
Automobile Maintenance	48.19	155.73
Purchases and Settlements	497.50	7,701.60
Perpetual Care Fund Contributions	00.00	175.00
Removal and Reinterment of Bodies	747.93	7,373.29
Removal and Resetting of Monuments	450.19	6,319.88
Miscellaneous Expense	00.00	123.51
Sub Total Removals to Other Cemeteries	$2,046.74	$28,594.93
Total Quabbin Reservoir Cemeteries	$30,036.70	$156,270.98
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 47, Construction of Service Building and Head House at Shaft 12	$6,770.57	$31,176.09
Contract No. 49, Excavation of Diversion Channels	8,500.00	84,789.69
Contract No. 51, Construction of East Branch Baffle	41,575.63	189,545.99
Contract No. 56, Construction of Administration Buildings at Main Dam	84,085.31	84,085.31
Completed Contract No. 59, Drilling a Well for Water Supply at Administration Buildings	691.28	691.28
Total Construction Contracts	$141,622.79	$390,288.36
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:		
Salaries, Engineering	$3,206.50	$3,206.50
Legal Expense	2,145.45	2,145.45
Miscellaneous Expense	314.98	314.98
Total Awards by Court Decree—Action for Breach of Contracts	$5,666.93	$5,666.93

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
OTHER PERMANENT CONSTRUCTION—CONSTRUCTION EXCEPT CLEARING:		
Installed Equipment	$1,287.93	$1,502.71
Labor	1,321.50	1,682.50
Compensation to Labor for Injuries	208.10	208.10
Automobile Maintenance	-1.20	00.00
Miscellaneous Expense (undistributed)	615.62	677.38
Printing and Blueprinting	00.00	24.88
Sub Total other Construction Except Clearing	$3,431.96	$4,094.97
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:		
Tools and Equipment	$296.58	$22,764.76
Labor	125,827.42	1,721,299.70
Compensation to Labor for Injuries	22,653.23	29,786.93
Miscellaneous Expense (undistributed)	328.71	2,743.64
Printing and Blueprinting	00.00	69.76
Stationery and Office Supplies	35.21	1,029.84
Postage	11.00	186.71
Automobile Purchase	-10.44	12,031.53
Automobile Maintenance	1,499.94	5,404.67
Furniture and Fixtures	00.00	877.65
Rent and Upkeep	141.65	826.98
Medical and Surgical Equipment	48.00	72.82
Medical and Surgical Supplies	213.95	2,023.67
Medical and Surgical Services	10,612.72	13,558.13
Fire Protection		
Equipment	00.00	425.87
Miscellaneous Expense	4.12	132.72
Labor	1,933.50	4,175.00
Legal Expense	3,870.43	4,285.43
Sub Total Other Permanent Construction—1936 Clearing Project	$167,466.02	$1,821,795.81
OTHER PERMANENT CONSTRUCTION—QUABBIN RESERVOIR CLEARING EXCEPT 1936 CLEARING PROJECT:		
Labor	$23,848.80	$23,848.80
Sub Total Other Permanent Construction-Quabbin Reservoir Clearing Except 1936 Clearing Project	$23,848.80	$23,484.80
Total Quabbin Reservoir Other Permanent Construction	$194,746.78	$1,849,739.58
HIGHWAY AND PUBLIC UTILITY RELOCATION:		
Salaries, Engineering and Clerical	$16,082.85	$211,754.29
Legal and Expert Expense	00.00	49.10
Consultant Expense	662.81	9,117.56
Labor	3,468.65	11,462.16
Furniture and Fixtures	00.00	61.74
Completed Contracts Nos. 21, 40, 41, 43 and 44	00.00	818,616.49
Completed Contract No. 54, Construction of a Highway in the Towns of Dana and Petersham	10,582.73	63,840.60
Completed Contract No 55, Construction of a Portion of the Petersham-New Salem Highway in the County of Worcester	35,455.61	128,165.18

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Contract No. 57, Construction of a Portion of the Petersham-New Salem Highway in the County of Franklin	55,098.37	82,409.04
Installed Equipment	00.00	811.57
Temporary Equipment	00.00	149.50
Engineering Instruments	00.00	948.75
Automobile Purchase	00.00	535.00
Automobile Maintenance	625.48	6,009.79
Miscellaneous Expense (undistributed)	2,823.73	8,651.30
Printing and Blueprinting	11.70	686.88
Stationery and Office Supplies	00.00	159.13
Maintenance of Real Estate	00.00	551.60
Total Highway and Public Utility Relocation	$124,811.93	$1,343,979.68
QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, NURSERIES:		
Nurseries:		
Salaries, Engineering	$621.00	$1,798.15
Labor	7,343.29	19,213.62
Tools and Equipment	1,045.47	3,615.21
Automobile Purchase	00.00	398.50
Automobile Maintenance	324.31	578.36
Nursery Stock	2,622.85	2,622.85
Nursery Supplies	-3,119.29	1,850.12
Miscellaneous Expense	26.65	193.78
Sub Total Reforestation, Nurseries	$8,864.28	$30,216.59
QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, WATERSHED PLANTING:		
Watershed planting:		
Salaries, Engineering	$465.50	$903.26
Labor	4,716.00	12,516.10
Tools and Equipment	00.00	184.81
Automobile Maintenance	94.66	166.17
Trees for Watershed Planting	1,713.00	1,713.00
Nursery Supplies	55.86	1,402.86
Miscellaneous Expense	00.00	63.85
Sub Total Reforestation, Watershed Planting	$7,045.02	$16,950.05
Total Quabbin Reservoir Watershed Protection	$15,909.30	$47,166.64
TOTAL QUABBIN RESERVOIR, EXCEPT MAIN DAM AND DIKE	$1,468,255.34	$14,778,719.23

QUABBIN RESERVOIR MAIN DAM

GENERAL OVERHEAD		
Administration, Commissioners' Office	$2,781.60	$39,507.48
Engineering, Headquarters' Office	11,470.69	140,531.55
Total General Overhead	$14,252.29	$180,039.03
ENGINEERING:		
Salaries, Engineering and Clerical	$49,537.31	$221,868.94
Legal and Expert Expense	4.06	4.06

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Consultant Expense	00.00	5,718.54
Labor	11,112.56	26,229.49
Furniture and Fixtures	8.58	219.09
Laboratory Equipment	210.74	664.51
Rental of Equipment	00.00	1,202.25
Engineering Instruments	105.84	736.38
Rent and Upkeep	261.19	1,315.44
Automobile Purchase	938.00	2,433.00
Automobile Maintenance	1,551.04	5,657.31
Contracts for Investigations and Surveys	00.00	61,895.52
Office Buildings	00.00	578.39
Special Experiments	62.50	1,853.29
Water Supply System	00.00	20.00
Medical and Surgical Services	4.00	4.00
Miscellaneous Expense (undistributed)	463.09	12,533.24
Printing and Blueprinting	67.27	1,794.30
Stationery and Office Supplies	316.60	1,276.86
Postage	37.01	133.58
Laboratory Supplies	195.64	195.64
Total Engineering	$64,875.43	$346,333.83
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 30, 32 and 36	$00.00	$804,913.52
Completed Contract No. 38, Constructing a Core Wall to Sound Rock at Main Dam	120,632.17	1,606,629.88
Contract No. 52, Constructing Embankment at Main Dam	768,286.80	822,591.90
Total Contracts	$888,918.97	$3,234,135.30
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$1,010.55	$4,584.25
Installed Equipment	339.05	3,592.05
Temporary Equipment	00.00	4.213.39
Miscellaneous Expense	129.86	12,619.55
Total	$1,479.46	$25,009.24
TOTAL QUABBIN RESERVOIR MAIN DAM	$969,526.15	$3,785,517.40

QUABBIN RESERVOIR BEAVER BROOK DIKE

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$959.64	$28,116 49
Engineering, Headquarters' Office	4,626.67	105,045.70
Total General Overhead	$5,586.31	$133,162.19
ENGINEERING:		
Salaries, Engineering and Clerical	$29,911.60	$163,582.19
Consultant Expense	00.00	5,505.11
Labor	6,554.00	29,818.64
Furniture and Fixtures	1.23	146.95
Laboratory Equipment	210.71	526.44
Rental of Equipment	00.00	921.50
Engineering Instruments	00.00	155.65
Rent and Upkeep	12.03	28.03
Automobile Purchase	00.00	600.00

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Automobile Maintenance	589.17	2,956.11
Contracts for Investigations and Surveys	00.00	24,773.32
Special Experiments	62.50	305.20
Miscellaneous Expense (undistributed)	26.52	4,899.00
Printing and Blueprinting	17.83	1,335.46
Stationery and Office Supplies	25.05	186.00
Advertising	00.00	79.34
Postage	00.00	00.30
Laboratory Supplies	213.29	213.29
Total Engineering	$37,623.93	$236,032.53
Permanent Construction—Construction Contracts:		
Completed Contracts Nos. 32 and 36	$00.00	$1,054,137.90
Contract No. 50, Constructing the Embankment of the Dike	262,518.34	1,360,702.17
Total Contracts	$262,518.34	$2,414,840.07
Permanent Construction—Except Construction Contracts:		
Labor	$1,251.80	$11,009.05
Temporary Equipment	00.00	1,993.18
Tools and Equipment	00.00	14.70
Miscellaneous Expense	8.44	1,685.76
Installed Equipment	00.00	235.00
Total	$1,260.24	$14,937.69
Total Quabbin Reservoir Beaver Brook Dike	$306,988.82	$2,798,972.48

Special Investigations

Relative to Pollution of Ware and Quinapoxet Watersheds:		
(Expenditures under Chapter 66, Resolves of 1931)	$00.00	$1,995.99
Relative to Setting Off a Portion of Lake Cochituate for Boating and Fishing:		
(Expenditures under Chapter 18, Resolves of 1936)		
General Overhead:		
Administration, Commissioners' Office	$00.00	$1,508.78
Engineering, Headquarters' Office	00.00	4,058.25
Total General Overhead	$00.00	$5,567.03
Engineering:		
Salaries, Engineering and Clerical	$58.65	$5,904.02
Labor	4.50	205.00
Automobile Maintenance	37.50	85.35
Miscellaneous Expense (undistributed)	71.23	477.27
Printing and Blueprinting	23.67	76.61
Stationery and Office Supplies	2.82	17.90
Laboratory Supplies	00.00	65.00
Contracts for Investigations and Surveys	114.40	114.40
Total Engineering	$312.77	$6,945.55
Total Chapter 18 Investigation	$312.77	$12,512.58

RELATIVE TO IMPROVING DISTRIBUTION SYSTEM AND PREVENTING POLLUTION OF SOURCE OF SUPPLY OF METROPOLITAN WATER DISTRICT

(Expenditures under Chapter 48, Resolves of 1936)

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$1,209.10	$2,433.76
Engineering, Headquarters' Office	10,645.92	13,879.37
Total General Overhead	$11,855.02	$16,313.13
ENGINEERING:		
Salaries, Engineering and Clerical	$40,748.65	$41,635.45
Furniture and Fixtures	221.98	221.98
Engineering Instruments	1,120.12	1,120.12
Atlases	2,097.00	2,097.00
Automobile Purchase	1,492.50	1,492.50
Automobile Maintenance	1,754.46	1,754.46
Contracts for Investigations and Surveys	47,973.30	47,973.30
Miscellaneous Expense (undistributed)	2,158.42	2,162.12
Printing and Blueprinting	231.14	231.14
Stationery and Office Supplies	201.14	201.14
Laboratory Supplies	23.46	23.46
Total Engineering	$98,022.17	$98,912.67
Total-Chapter 48 Investigation	$109,877.19	$115,225.80
TOTAL SPECIAL INVESTIGATIONS	$110,189.96	$129,734.37

SOUTHERN SUDBURY EMERGENCY SUPPLY

GENERAL OVERHEAD:	$00.00	$42,098.25
ENGINEERING:	00.00	44,235.07
REAL ESTATE:	00.00	30,553.18
SOUTHERN SUDBURY DIVERSION DAMAGES:	00.00	50,752.66
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:	00.00	458,957.30
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:	00.00	11,937.37
TOTAL SOUTHERN SUDBURY EMERGENCY SUPPLY	$00.00	$638,533.83

SUMMARY

CONSTRUCTION FUND

			Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Total authorized under Chapters 111 and 375, Acts of 1926, and Chapter 321, Acts of 1927		$65,900,000.00		
Amount reverted from authorization under said Chapter 111		261,466.17		$65,638,533.83
Rec'd from City of Worcester under said Chapter 321	$1,000,000.00			
Serial bonds issued and matured	6,954,000.00			
Serial Bonds outstanding Nov. 30, 1937	35,296,000.00			
Balance of authorization	22,388,533.83			
	$65,638,533.83			
Total Construction Fund				$65,638,533.83

EXPENDITURES

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Wachusett-Coldbrook Tunnel, Ware Supply	$343,903.12	$14,064,544.03
Wachusett- Watershed Protection	1,865.19	6,738.29
Coldbrook-Swift Tunnel	21,452.68	5,343,795.52
Quabbin Reservoir Except Main Dam and Dike	1,468,255.34	14,778,719.23
Quabbin Reservoir Main Dam	969,526.15	3,785,517.40
Quabbin Reservoir Beaver Brook Dike	306,988.82	2,798,972.48
Special Investigations:		
Pollution of Ware and Quinapoxet Watersheds (Chapter 66, Resolves of 1931)	00.00	1,995.99
Setting off of a Portion of Lake Cochituate (Chapter 18, Resolves of 1936)	312.77	12,512.58
Improving Distribution System and Preventing Pollution (Chapter 48, Resolves of 1936)	109,877.19	115,225.80
Southern Sudbury Emergency Supply	00.00	638,533.83
Unassigned	-421.15	00.00
Total Expenditures	$3,221,760.11	$41,546,555.15
Unexpended Balance		$24,091,978.68
		$65,638,533.83

RECEIPTS

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Receipts from Sales	$90,285.15	$351,424.33
Receipts for Rents	42,067.11	437,037.44
All other Receipts	3,406.01	106,272.28
Total Receipts	$135,758.27	$894,734.05

DISTRIBUTION OF RECEIPTS

		Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Credited as follows:			
To Assessments			
Rents and Sales, to 1928 Assessment	$3,033.03		
Rents and Sales, to 1929 Assessment	24,343.77		
Interest, to 1928-1934 Assessments	282.11	00.00	$27,658.91
To Construction Fund . .		$135,758.27	867,075.14
		$135,758.27	$894,734.05

Financial Statement Verified.

Approved.

GEO. E. MURPHY,
Comptroller.

*Expenditures by the Metropolitan District Water Supply Commission are made under authority of the following acts and resolves:

Chapter	*Brief Description*
375, Acts of 1926	Commission created; Ware Supply (Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct and Ware River intake works) and Purchase of Real Estate for Swift Supply.
111, " " 1927	Southern Sudbury Emergency Supply. (Pipe lines diverting headwaters of Sudbury river.)
321, " " 1927	Swift Supply (Coldbrook-Swift Tunnel Section of Quabbin Aqueduct and Quabbin Reservoir.)
340, " " 1928	Management of Town of Prescott by Agents appointed by Metropolitan District Water Supply Commission.
66, Resolves of 1931	Investigation of Quinapoxet and Ware Watersheds by Joint Board.
116, Acts of 1932	Dissolution of Religious Societies affected by Reservoir.
262, " " 1932	Protection of Ware and Wachusett Watersheds including Rutland-Holden Sewer.
30, Resolves of 1933	Compensation to an Injured Employee.
214, Acts of 1934	Metropolitan Water District representation on Board of Referees.
18, Resolves of 1936	Investigation by Joint Board of use of part of Lake Cochituate for boating and fishing.
33, " " 1936	State Treasurer to receive and invest Perpetual Care Funds for Lots in Quabbin Park Cemetery.
48, " " 1936	Investigation of Improvements in Distribution System, and elimination of pollution of Water Supply.
52, " " 1937	Selectmen, Trustees, or other officers of churches or cemeteries are authorized to transfer any Perpetual Care Funds to State Treasurer on written request of Metropolitan District Water Supply Commission.
347, Acts of 1937	Reimbursement of Hampshire County for Trial Costs of Superior Court cases of Metropolitan Water Supply.
348, " " 1937	Reimbursement of Hampden County for Trial Costs of Superior Court cases of Metropolitan Water Supply.
352, " " 1937	Public advertising of contracts for over $1,000.00 by Metropolitan District Commission and Metropolitan District Water Supply Commission.

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

LOCATION OF REAL ESTATE ACQUIRED FOR THE QUABBIN RESERVOIR

(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL - NOV. 30, 1936.		TOTAL FOR YEAR ENDING NOV. 30, 1937. (ACRES)	TOTAL NOV. 30, 1937. (ACRES)	REMARKS
	1936 ANNUAL REPORT (ACRES)	REVISED - SEE NOTE (ACRES) *			
BARRE	—	—	22	22	* Revisions have been made using acreages obtained from surveys wherever available, otherwise from deeds, property blanks, etc.
BELCHERTOWN	3,016	3,015	48	3,063	
DANA	8,939	8,923	688	9,611	
ENFIELD	8,805	8,806	20	8,826	
GREENWICH	11,012	11,012	173	11,185	
HARDWICK	3,359	3,359	218	3,577	
NEW SALEM	10,228	10,173	666	10,839	
ORANGE	19	19	—	19	
PELHAM	4,955	4,961	—	4,961	
PETERSHAM	1,457	1,469	243	1,712	
PRESCOTT	10,578	10,578	81	10,659	
SHUTESBURY	3,871	3,872	191	4,063	
WARE	829	829	48	877	
WENDELL	347	347	30	377	
TOTALS	67,415	67,363	2,428	69,791	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

TAKINGS OF REAL ESTATE AND WATER RIGHTS

TAKING FOR	TAKING NO.	TOWN	COUNTY	DATE OF TAKING	PLAN NO.	TITLE VESTED IN COMMONWEALTH	
						FEE (Acres)	EASEMENT (Acres)
Southern Sudbury Emergency Supply.	1 to 9 incl.	Details previously reported in the 1930 Annual Report.			C-1 to C-15 incl.	258.81	29.02
						(Also Water Rights)	
Wachusett-Coldbrook Tunnel section of Quabbin Aqueduct.	1 to 4 incl.	Details previously reported in the 1930 Annual Report.			T-1 to T-13 incl.	570.22	20.37
Coldbrook-Swift Tunnel section of Quabbin Aqueduct.	1 to 3 incl.	Details previously reported in the 1931 Annua Report. *(391.42 acres of this total are within the Quabbin Reservoir Area.)			T-14 to T-27 incl.	*544.81	4.06
Quabbin Reservoir.	1 to 17 incl.	Details previously reported in the 1931, 1932, 1933, 1934, 1935 and 1936 Annual Reports.			S-1 to S-35 incl.	743.94	20.09
						(Also Water Rights)	
" "	18	Prescott & Greenwich	Hampshire	July 8, 1937	S-36 & S-37	219.20	
" "	19	Greenwich & Hardwick	Hampshire & Worcester	Aug. 5, 1937	S-38	164.90	
" "	20	Enfield	Hampshire	July 27, 1937	S-39 & S-40	6.36	
" "	23	Greenwich	"	Aug. 19, 1937	S-46 & S-47	20.07	
" "	24	"	"	Sept. 30, 1937	S-53	4.00	
" "	25	New Salem & Shutesbury	Franklin	Sept. 30, 1937	S-51 & S-52	69.90	
" "	26	Prescott & Greenwich	Hampshire	Sept. 30, 1937	S-48 & S-49	537.63	
" "	27	Dana & Petersham	Worcester	Sept. 30, 1937	S-50	38.64	
" "	28	Greenwich	Hampshire	Sept. 30, 1937	S-54 & S-55	7.40	
						1,812.04	20.09
Ware River Supply and Watershed.	1 to 2 incl.	Details previously reported in the 1931, 1932 and 1933 Annual Reports.			W-1 and A-1 to A-14 incl.	0.25	22.94
						(Also Water Rights)	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1936 AND NOV. 30, 1937

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
38	Core Wall to Bed Rock at Dam Site.	Belchertown, Enfield and Ware.	Swift	The Two Companies, Inc.	May 7, 1935	9	May 9, 1935	$1,330,765.00	$1,606,629.88	Aug. 5, 1937.
51	East Branch Baffle, Quabbin Reservoir Site.	Greenwich & Hardwick.	Swift	Franklin A. Snow Company	May 14, 1936	8	May 28, 1936	219,075.00	★199,045.99	July 21, 1937.
54	Construction of Dana-Petersham Highway.	Dana & Petersham.	Swift	Carlo Bianchi & Company	May 7, 1936	14	May 7, 1936	68,040.00	63,840.60	Dec. 7, 1936.
55	Portion of Petersham-New-Salem Highway.	Petersham	Swift	Arute Bros. Incorporated	May 21, 1936	6	June 7, 1936	251,955.25	**239,156.65	Aug. 27, 1937.
59	Drilling Well for Water Supply.	Belchertown	Swift	Wachusett Artesian Well Co.	Mar. 18, 1937	3	Mar. 18, 1937	857.50	691.28	Apr. 22, 1937.

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1937

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
33	Purchase of Power at Shaft 1.	West Boylston	Ware	New England Power Co.	Date of Agreement = Aug. 6, 1931.			Agreed Rates	$ 2,235.63
42	Use of Worcester Sewerage System and Treatment Works %c Rutland-Holden Sewer.	Worcester	Ware	City of Worcester	Date of Agreement = May 1, 1933.			Lump Sum = $ 325,000.00 Annual Charges = *	325,000.00 775.10
46	Connection with Rutland Holden Sewer, & Disposal of Sewage from the U.S. Veterans Hospital.	Rutland (Note:- Payments under Contract 46 are RECEIVED by the M.D.W.S.C.)	Ware	U.S. Veterans Administration	Date of Agreement = Nov. 7, 1934			Lump Sum 37,000.00 Annual Charges = *	37,000.00 1,025.23
47	Service Building & Head House at Shaft 12 of Quabbin Aqueduct.	Greenwich	Swift	Vincent Caira	April 17, 1936	4	April 21, 1936	34,990.00	31,176.09
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium.	Rutland (Note:- Payments under Contract 48 are RECEIVED by the M.D.W.S.C.)	Ware	Rutland State Sanatorium.	Date of Agreement = June 5, 1934			Lump Sum = 60,000.00 Contingent Charges = *	60,000.00 None
49	Excavating Diversion Channels at the Site of Quabbin Reservoir.	Dana, Hardwick & Greenwich.	Swift	Cenedella & Co.	Sept. 10, 1935	12	Oct. 1, 1935	79,050.00	† 84,789.69
50	Dike Embankment - Quabbin Reservoir.	Enfield & Ware.	Swift	The Arthur A. Johnson Corporation	Nov. 13, 1934	6	Nov. 26, 1934	1,446,655.00	1,360,702.17
52	Main Dam Embankment - Quabbin Reservoir.	Belchertown, Enfield & Ware.	Swift	Benjamin Foster Company	July 2, 1936	9	July 16, 1936	2,317,445.00	822,591.90
53	Head House at Shaft #9, Quabbin Aqueduct.	Barre	Swift	The English Construction Company	April 24, 1936	2	Apr. 30, 1936	9,300.00	† 8,118.90
56	Constructing Administration Bldgs., Main Dam.	Belchertown	Swift	Rich Bros. Construction Co., Inc.	June 10, 1937	14	June 24, 1937	362,445.00	84,085.31
57	Portion of Petersham-New Salem Highway.	New Salem	Swift	John Iafolla Constr. Co.	July 2, 1936	6	July 2, 1936	161,109.50	**†142,640.38
58	Making Core Borings (A contract by the Joint Board under Chapter 48, Resolves of 1936)	Counties of Middlesex, Norfolk, Suffolk and Worcester.	Special Investigation	Pennsylvania Drilling Company.	Mar. 18, 1937	6	Mar. 23, 1937.	52,950.00	44,794.00

* Proportion of Annual Maintenance Cost.

(The above contracts were all awarded to the lowest bidder.)

** Of these amounts the State Dept. of Public Works has paid $110,991.47 on Cont. 55, and $60,231.34 on Cont. 57, covering the surfacing and guard rail items on both contracts, also traffic signal duct items on Cont. 55.

★ $9,500.00 of this total is held pending outcome of Contractor's petition.

† Work accepted, final settlement pending.

MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHEDS, 1937

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
WARE WATERSHED													
Ware River Intake Works*	5.33	2.32	3.04	4.17	4.28	4.91	2.26	5.73	3.78	3.58	5.84	2.84	48.08
West Rutland*	5.60	2.46	3.20	4.38	4.52	5.21	2.36	6.16	3.82	3.77	6.93	3.11	51.52
North Rutland	5.36	2.13	2.86	4.53	2.85	5.95	1.46	5.52	5.19	3.65	7.78	2.50	49.78
Williamsville	5.57	2.24	3.09	4.94	4.60	5.45	2.70	5.79	5.47	4.73	6.05	2.78	53.41
Hubbardston	5.05	2.03	2.56	4.45	4.29	5.57	1.90	6.43	4.49	3.76	6.18	2.33	49.04
1937 Mean	5.38	2.23	2.95	4.49	4.11	5.42	2.14	5.93	4.55	3.90	6.56	2.71	50.37
14-Year Mean	3.56	2.88	3.76	3.59	3.26	3.84	3.88	4.15	4.74	3.35	3.54	3.11	43.66
SWIFT WATERSHED													
West Ware	5.13	1.97	3.12	3.68	4.34	6.30	1.86	6.41	5.15	3.48	5.73	2.47	49.69
Enfield*	6.08	2.38	3.53	4.07	5.05	6.49	2.60	5.97	5.30	4.63	6.72	2.89	55.71
Greenwich	5.62	1.86	3.11	3.97	5.16	6.78	1.74	4.99	5.78	4.04	6.28	2.89	52.22
North Dana	5.63	1.52	3.18	4.29	5.09	Station Discontinued							
Dana	5.05	2.31	2.67	4.39	5.10	5.42	3.48	6.27	5.36	3.96	6.63	2.12	52.76
Packardsville	5.12	2.19	3.60	4.70		Station Discontinued							
Prescott	5.78	2.06	2.94	4.00	4.57	6.73	2.47	5.51	6.90	5.23	7.27	2.92	56.38
Shutesbury	5.80	2.74	3.63	4.97	5.87	8.00	2.82	7.04	4.82	5.77	7.09	3.03	61.58
New Salem	5.69	2.34	3.45	3.19	5.23	7.42	1.87	7.49	5.19	5.31	6.64	3.25	57.07
Wendell	5.63	2.75	3.55	6.75	6.10	6.75	3.25	5.13	6.44	5.79	7.07	3.20	62.41
Petersham**	5.36	2.14	3.60	4.37	4.58	6.15	3.81	3.60	4.71	4.37	6.40	2.67	51.76
1937 Mean***	5.57	2.28	3.29	4.38	5.11	6.67	2.66	5.82	5.52	4.73	6.65	2.83	55.51
18-Year Mean***	3.58	2.95	3.65	4.15	3.51	4.73	3.99	4.26	4.62	3.22	4.13	3.29	46.08

* Station maintained by Metropolitan District Water Supply Commission.
** Station maintained by Metropolitan District Commission.
Data for all other stations obtained through courtesy of State Department of Public Health.
*** Rainfall for North Dana and Packardsville stations not included in these figures as the stations were discontinued during the year.

Public Document No. 147

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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING NOVEMBER 30, 1938

Publication of this Document Approved by the Commission on Administration and Finance

1m-1-'40. D-1523.

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1938 its

THIRTEENTH ANNUAL REPORT

I. Organization and Administration

Eugene C. Hultman continued as Chairman of the Commission and Thomas D. Lavelle and Edward J. Kelley as Associate Commissioners. R. Nelson Molt continued as Secretary.

During the past year the Administrative functions of the Commission have been greatly increased by new construction work authorized by Chapter 460 as amended by Chapter 501 of the Acts of 1938.

This new construction was made possible because of the saving by the Commission estimated from $12,000,000.00 to $14,0000,000.00 from the appropriation of $65,000,000.00 authorized in 1926 and 1927 by the Legislature and these Acts were passed after consideration of the special report which, prepared under Chapter 48, Resolves of 1936, by a joint board consisting of this Commission and the Department of Public Health relative to improvements in distribution and to adequate prevention of pollution of sources of water supply of the Metropolitan water district and printed as House document No. 262, 1938, recommended among other things that the Legislature authorize the construction by this Commission of portions of a pressure aqueduct for improving the distribution of water from the sources of supply to the Metropolitan water district.

The Commission by said Chapters 460 and 501 was empowered to cooperate with the State Emergency Public Works Commission in making applications for Federal PWA ~~W.P.A.~~ grants covering all major new contracts required for the completion of the Ware-Swift supply and Quabin Reservoir, the construction of a pressure aqueduct from the Wachusett Aqueduct Terminal Chamber to a point of connection with the Weston Aqueduct Terminal Chamber and supply mains near the Charles River, and the construction of additional pipe lines in the Weston Aqueduct siphons. One such application was made August 16 for a project covering the additional construction needed to bring the existing Weston Aqueduct up to its designed capacity and a P.W.A. grant of $207,000.00 of Federal funds was received as a contribution towards the estimated cost of $460,000.00 for this project.

Another application was made August 30 for a project including several major contracts required to complete the Ware-Swift supply and Quabbin Reservoir, the principal item being for the clearing of the Reservoir, and the construction of the pressure aqueduct and appurtenances; and a P.W.A. grant of $6,984,900.00 of Federal funds was received as a contribution towards the estimated cost of $15,522,000.00 for this project.

The Legislative acts appropriated no additional funds except that they made available for the construction of the pressure aqueduct and the Weston Aqueduct siphons the unexpended balance of previous appropriations for the construction of the Ware-Swift supply. The granting of Federal funds to supplement this unexpended balance makes it possible to construct a considerable portion of the pressure aqueduct system recommended by the Joint Board as the ultimate solution of the problem of distribution of water in the District.

The Legislature by Chapters 240 and 455 of 1938 amended Chapter 321 of the Acts of 1927 and provided for the annexation of the town of Dana, as well as certain portions of Prescott and Greenwich, to the town of Petersham, and the Commission was authorized to end the corporate existence of the town of Dana in addition to the three towns of Enfield, Greenwich and Prescott.

The Commission on March 24, 1938 ordered a taking of about 120 square miles of land within the Quabbin Reservoir area. This taking embraced the towns of Dana, Enfield, Prescott and Greenwich and included for the most part land and buildings which the Commission had previously acquired; it also included such other property necessary for the construction of the reservoir, title to which had not been passed to the Commonwealth.

This taking was duly recorded on March 28, 1938 in the Registries of Deeds in the Counties of Hampshire, Franklin and Worcester and provides a complete record in each county for the convenience of the public.

Thirty days later, on April 28, 1938, the corporate existence of these four towns ceased and as provided by Chapter 321 of the Acts of 1927, and amendments thereto, the Commission acquired all the property, real and personal, and other assets of the towns and assumed all the liabilities of these municipalities.

The Secretary was appointed general agent of the Commission to liquidate and terminate, under the direction of the Commission, the affairs of each town as speedily as possible. The duties were varied as it was necessary to carry on schools to the end of the school year; generally oversee the collection of towns accounts and pay proper charges against the towns, deliver to the Secretary of State such documents from the towns as by law were required to be so delivered and to take custody of and preserve vital statistics, voting lists and other town records of permanent value.

The Commission wishes to note that full cooperation was received from other departments of the Commonwealth whereby work incident to the closing up of those towns was greatly expedited. In view of the fact that never before in the history of the Commonwealth have four communities lost their corporate existence at one and the same time and their affairs liquidated, it is a source of satisfaction to the Commission that it fulfilled its task speedily and with little or no friction.

The Commission deems it of interest to note that the town seals of these four towns have been given to the custody of the American Antiquarian Society where they will be properly designated and permanently exhibited in the Society's building at Worcester, Massachusetts, and further that such papers, pamphlets and other historical material not required by the Secretary of State or permanent records of the towns have also been given to its custody, and will be available for the use of all persons interested.

It is the intention of the Commission for the convenience of the public to house all of the permanent town records and vital statistics required to be preserved by law in fireproof vaults in the new Administration Buildings of the Commission located at Belchertown, Massachusetts, (on Massachusetts highway designated as Route No. 9), and to that effect there is appended at the end of this report an amendment of said Chapter 240 of the Acts of 1938.

The Commission having been duly advised in writing by the Attorney General that it was within the scope of its authority, has sponsored two WPA sewer projects, one in the town of Holden and one in the town of Rutland. The Commission will furnish such materials and supplies as may be necessary to construct sanitary sewers in said towns connecting with the existing main line sewer already constructed by the Commission from Rutland to Worcester, and the towns will furnish the necessary land therefor, while the Federal Government will provide the labor. By these systems the Ware and Wachusett watersheds will be relieved of a substantial and growing amount of pollution.

The clerical force of the Commission was increased to meet the requirements of all this additional work by two clerks who were added to assist the three special agents under the direction of the Commission who continued to care for the property acquired by the Commission in the Swift and Ware River areas.

Real estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 148 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 545 persons.

A force of local labor of 103 persons was employed during the year in forestry and reforestation work, the removal of bodies, and miscellaneous work for clearing and burning brush and slash on the area below the future reservoir flow line.

II. Engineering Department

Frank E. Winsor continued as Chief Engineer, Karl R. Kennison as Assistant Chief Engineer, Walton H. Sears as Mechanical Engineer, Stanley M. Dore and Charles L. Coburn as Associate Civil Engineers, and William W. Peabody as Division Engineer of the Quabin Reservoir and Aqueduct Division with an office at Enfield, Massachusetts. The Wayland-Weston Division was established with Coleman C. McCully as Division Engineer, covering about nine miles of the easterly portion of the pressure aqueduct, with an office in Natick, Massachusetts. The Southborough-Framingham Division was established with Frederick W. Gow as Division Engineer, covering about nine miles of the westerly portion of the pressure aqueduct.

At the request of the Attorney General, consultants were employed from time to time when necessary in the preparation of data for the defense of petitions for damages against the Commonwealth and for the collection and interpretation of data on mill and water power damages, and on the design of the dam and dike of Quabbin Reservoir and geological data.

III. Offices

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission building at 20 Somerset Street, Boston. Offices at various places on the work were occupied from time to time as required and the office of the Quabbin Reservoir Division and laboratories for water analysis and soil testing were continued at Enfield. The office of the Wayland-Weston Division was established at 35 Main Street, Natick and of the Southborough-Framingham Division, at 4 Walker Street, Marlborough.

IV. Real Estate and Water Rights

The Commission, for reservoir purposes and sanitary protection, has acquired a total to date of approximately 80,135 acres of land in the Swift River watershed, and for sanitary protection and construction purposes in the Ware River watershed a total of about 14,751 acres. The Commission during the year from time to time publicly advertised for sealed proposals for the purchase of such standing timber as remained below the flow line of Quabbin Reservoir and accepted the highest bids therefor.

On July 25 notice was sent by the Commission to all tenants of property owned or taken by the Commission within the Quabbin Reservoir area that the Commission required the property for the use of the Commission. Rentals of property within the area then ceased with the exception of engineers and other persons by necessity remaining there.

The Commission wishes to note that a total of $962,932.83 has been collected by the Commission in sales and rentals and salvage of property acquired by it from the inception of the Commission to the end of the 1938 fiscal year.

From September 12 to 21, rain fell almost continuously throughout Central Massachusetts. The maximum total rainfall on the Ware Watershed for this period, 17.69″, was reported at Hubbardston and the maximum total rainfall on the Swift Watershed was reported as 14.29″ at Enfield.

On September 21, 1938, both the Ware and Swift Rivers were at flood height. At the dam of the Intake Building on the Ware River at Coldbrook, the peak reached at 11:15 A.M. was 14,000 cubic feet a second or at the rate of 6,283,000 gallons per minute or 9,050,000,000 gallons a day or 2⅓ times the flood during the year 1936.

While no damage resulted to the structures of the Commission, the flood made access to Coldbrook impossible except by walking along the tracks of the Ware River Branch of the Boston & Albany Railroad.

On the Swift River high water prevailed which was safely taken through the diversion tunnel, which as in 1936 saved the works of the Commission in the Swift River Valley from all possible damage.

The baffle dam, so called, at Greenwich Village held back water from the East Branch of the Swift River and temporarily formed a large lake of about 4,000,000,000 gallons extending northwards towards Dana and North Dana.

This lake cut off the main North and South highway in the Swift River Valley, and the channel excavated by the Commission in 1936 under Contract No. 49 was filled and carried the water into the Middle Branch of the Swift River in that part of the former town of Prescott known as Soapstone. This storage of the water reduced materially the peak of the flood on the Swift River, and while Bondsville, Three Rivers, Ludlow and Chicopee were damaged by the flood, still greater damage would have otherwise resulted.

During the afternoon of September 21, 1938, the hurricane struck the Ware and Swift River Valleys. No material damage was done to structures of the Commission but roads not already cut off by flood were made impassable by felled trees and wires and during the night of the twenty-first, and the forty-eight hours following, the force of the Commission was constantly on duty clearing roads and repairing means of communication and looking after the safety and security of those remaining in the Valley. The Commission wishes to thank all of its employees who during both the flood and hurricane worked to make possible the rapid resumption of the work of the Commission over the wide area where its operations are carried on.

The hurricane felled about 20,000,000 feet of merchantable pine timber and an unestimated amount of other smaller timber on the Quabbin watershed and 3,000,000 feet of merchantable pine timber on the Ware River watershed. While the Commission immediately engaged in salvage operations and is negotiating with the Federal Government for the sale thereof, the hazard of fires and the preparation of the area for reforestation present a greatly enlarged task on both watersheds.

V. Ware River Supply

No water was diverted from the Ware River, since no storage is available pending the completion of Quabbin Reservoir.

The policy of publicly advertising for bidders on all construction work was continued and Contract No. 64, for constructing the Service Buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre, Massachusetts, was advertised just prior to the grant of Federal P.W.A. funds as above described. The three low bidders all agreed to accept the contract as a P.W.A. contract without modification of the bid price and it was awarded on October 25 to Platt Contracting Co., Inc., Cambridge, Massachusetts. Work is in progress under this contract.

Contract No. 65, for installing shaft caps and aqueduct control valves, Wachusett Outlet Building at Shaft 1 of Quabbin Aqueduct, was awarded on September 22 to the Engineering Service and Construction Company. Work is in progress under this contract.

VI. Swift River Supply

Reforestation of areas above the flow line of Quabbin Reservoir was continued, seed beds planted and transplanting of seedlings carried on. The Commission continued its policy of salvaging young pine, spruce, hemlock, laurel, azaleas, etc., in areas which are to be flooded by Quabbin Reservoir.

Fire lanes were kept clear above the flow line of Quabbin Reservoir affording protection to the transplants set out on the watershed of Quabbin Reservoir as well as the large areas of standing timber.

The Benjamin Foster Company continued work under Contract No. 52, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware. The hydraulic sluicing operations were completed, the central portion of the embankment being carried to about elevation 530 or to the future flow line of the reservoir. Approximately 3,605,000 cubic yards out of a total of 3,695,000 cubic yards required in the embankment under this contract having been placed to date.

Rich Bros. Construction Co. Inc. completed work under Contract No. 56 for constructing the Administration Buildings at the main dam of Quabbin Reservoir in the town of Belchertown.

Contract No. 60, for constructing access roads at Shaft 12, was awarded on December 16 to the Middlesex Construction Company, Framingham, the lowest bidder. Work under this contract was completed.

P.W.A. contracts Nos. 61, 62 and 63 were awarded on October 20 to Coleman Bros. Corp., Boston, the lowest bidder, for clearing portions of Quabbin Reservoir.

Contract No. 66, for constructing regulating dams on the Middle Branch in New Salem and on the East Branch in Hardwick and Petersham, was advertised just prior to the grant of the Federal P.W.A. funds as above described. The three low bidders all agreed to accept the contract as a P.W.A. contract without modification of the bid price and this contract and P.W.A. contract No. 72 for clearing that portion of the Quabbin Reservoir site adjacent to Contract No. 66, were both awarded on October 20 to the C & R Construction Company, Boston, the lowest bidder. Work is in progress under these contracts.

Contract No. 88, for furnishing and storing top soil, was awarded on November 3 to Warner Bros. and Goodwin, Inc., Sunderland, Massachusetts, the lowest bidder. Work is in progress under this contract.

VII. Pressure Aqueduct

P.W.A. Contract No. 76, for making core borings along the proposed pressure aqueduct locations, was awarded on October 20 to Sprague & Henwood, Inc., Scranton, Pennsylvania, the lowest bidder. Work is in progress under this contract.

VIII. Weston Aqueduct Siphons

P.W.A. Contract No. 73, for constructing inverted pipe siphons on Weston Aqueduct, was awarded on November 9 to the Leo Butler Company, Katonah, New York, the lowest bidder. Work is in progress under this contract.

IX. General

The engineering force continued its studies for the development of hydroelectric power at various points on the work. No electric power can be generated, however, until the completion of Quabbin Reservoir provides the necessary storage of water.

Unprecedented floods occurred in September but no important damage was done to the Commission's property or to the work under construction.

X. Cemeteries

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 1556 bodies were removed from the Quabbin Reservoir area during the year, of which 1533 were reinterred in Quabbin Park Cemetery. To date a total of 6180 bodies have been removed from the Quabbin Reservoir area; of which 5236 were reinterred in Quabbin Park Cemetery. There have been 16 original burials during the year in Quabbin Park Cemetery, making a total to date of 133 original burials in this cemetery. The removal of bodies from the area which will soon be flowed by Quabbin Reservoir is practically completed.

Landscaping and maintenance of Quabbin Park Cemetery have been carried on during the year and studies made for the location and construction of a permanent service building.

XI. Financial

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

XII. Recommendations

The Commission having made its general taking for the Quabbin Reservoir area and for the past year been engaged in winding up the affairs of the towns of Dana, Enfield, Greenwich and Prescott, have determined that public convenience will be best served by the permanent retention of the vital statistics and other official papers of the four towns by the Metropolitan District Commission and there is appended hereto a draft of an amendment to Chapter 321 of the Acts of 1927 in substance providing for this.

The Commission further have determined that the best interests of those persons interested in the maintenance of Quabbin Park Cemetery will be most satisfactorily served by the transfer of said Cemetery upon completion of the work of the Metropolitan District Water Supply Commission, to the Metropolitan District Commission; and a draft of an amendment to Chapter 321 of the Acts of 1927 in substance providing for the same is annexed to this report.

XIII. Other Reports

The report of the Chief Engineer is herewith presented.

Respectfully submitted,

E. C. HULTMAN, *Chairman*
THOMAS D. LAVELLE, *Associate Commissioner*
EDWARD J. KELLEY, *Associate Commissioner*

20 Somerset Street, Boston, Massachusetts.
January 14th, 1939.

DRAFT OF PROPOSED LEGISLATION

THE COMMONWEALTH OF MASSACHUSETTS

In the Year One Thousand Nine Hundred and Thirty-Nine

An Act Providing for the Permanent Custody by the Metropolitan District Commission of the Records of the Towns of Dana, Enfield, Greenwich and Prescott.

WHEREAS, The deferred operation of this act would in part defeat its purpose, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

Section 1. Section 14 of Chapter 321 of the Acts of 1927 as amended by Section 5 of Chapter 240 of the Acts of 1938 is hereby further amended by striking out all of said first paragraph of said Section 5 after the word "possible" in line 22 and inserting in lieu thereof—Upon the final liquidation of the affairs of the towns of Dana, Enfield, Greenwich and Prescott, the commission shall provide a suitable place for the preservation of the records of permanent value of the towns of Dana, Enfield, Greenwich and Prescott, to be kept by them at the Administration Buildings, Belchertown, Massachusetts, until the completion of the work of the Metropolitan District Water Supply Commission whereupon they shall turn the same over to the Metropolitan District Commission to be kept and preserved at the site of Quabbin Reservoir for public convenience.

The secretaries of the respective commissions having custody of the records, or such other person as may be duly authorized by said commissions, shall issue, if requested, duly authenticated or attested copies of said records and such copies shall have the same evidentiary value as they would have had in the event that they were issued by a duly elected official of said towns.—So that said first paragraph of said Section 5 of Chapter 240 of the Acts of 1938 shall read as follows:

Section 5. Said chapter three hundred and twenty-one is hereby further amended by striking out section fourteen and inserting in place thereof the following:—Section 14. All of the property belonging to the towns of Dana, Enfield, Greenwich and Prescott shall, upon the annexation of said towns, to other towns by authority of this act, vest in and become the property of the commonwealth for the benefit of the metropolitan water district, and the commonwealth shall succeed to all the rights, claims and causes of action of each of said named towns, and shall assume and be liable for all the debts, obligations, trusts, duties and liabilities of each of said towns. All actions and causes of actions by or against the said towns of Dana, Enfield, Greenwich and Prescott, pending or accrued, when such annexation takes effect, shall survive, and may be prosecuted to final judgment and execution by or against the commonwealth. All books, papers, monies and other property in the possession of the treasurer of each of these four towns or of any town officer thereof shall be turned over to the commission at the time of said annexation, and the commission shall wind up and liquidate the affairs of each such town as speedily as possible. Upon the final liquidation of the affairs of the towns of Dana, Enfield, Greenwich and Prescott, the Commission shall provide a suitable place for the preservation of the records of permanent value of the towns of Dana, Enfield, Greenwich and Prescott, to be kept by them at the Administration Buildings, Belchertown, Massachusetts, until the completion of the work of the Metropolitan District Water Supply Commission whereupon they shall turn the same over to the Metropolitan District Commission to be kept and preserved at the site of Quabbin Reservoir for public convenience.

The secretaries of the respective commissions having custody of the records, or such other person as may be duly authorized by said commissions, shall issue, if requested, duly authenticated or attested copies of said records and such copies shall have the same evidentiary value as they would have had in the event that they were issued by a duly elected official of said towns.

THE COMMONWEALTH OF MASSACHUSETTS

In the Year One Thousand Nine Hundred and Thirty-Nine

An Act Providing That the Care and Control of Quabbin Park Cemetery Be Transferred to the Metropolitan District Commission Upon the Completion of the Work of the Metropolitan District Water Supply Commission.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

Section 1. Section 9 of Chapter 321 of the Acts of 1927 is hereby amended by striking out all of the first paragraph of said Section 9 after the word "therefor" in line 22 and inserting in lieu thereof—Any such general burial ground or grounds shall, upon the completion of the work of the Commission, be transferred to the Metropolitan District Commission and said transfer shall include the transfer of any trust funds established for the benefit or care of the cemetery or lots therin which contained remains thus removed to such general burial ground—so that said first paragraph of said Section 9 of said Chapter 321 of the Acts of 1927 shall read as follows:—

Section 9. If any burial ground, cemetery, grave or place of human burial is within the area taken in fee by the commission, or is located so near to the reservoir or other waterway as to be liable to pollute or reduce the quality or value of any such waters as a potable water supply, the commission shall remove the remains found in any such burial places. The Commission may agree with the next of kin, or other persons having the right to represent or dispose of such remains, as to the place or places to and in which such remains shall be removed and reinterred, and in such case the commission may pay the reasonable cost of a burial lot and shall pay the expenses reasonably necessary for such removal, including the removal and resetting of the gravestones, monuments and markers of such graves. In any case where such next of kin or other persons are unknown or unascertainable, or where there is no such agreement, the commission shall furnish a place or places for such reburials, and may establish a general burial ground or grounds therefor, and subject to the provisions of section thirty-five of chapter one hundred fourteen of the General Laws, may acquire by purchase or otherwise as provided by this act any lands needed therefor. Any such general burial ground or grounds shall, upon the completion of the work of the Commission, be transferred to the Metropolitan District Commission and said transfer shall include the transfer of any trust funds established for the benefit or care of the cemetery or lots therein which contained remains thus removed to such general burial ground.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

GENTLEMEN:—The following is a report of the engineering department for the year ending November 30, 1938.

ORGANIZATION

Early in the year the Legislature extended the scope of the work to be done by this Commission so as to include portions of a pressure aqueduct and other work in accordance with recommendations of the joint board, consisting of the Metropolitan District Water Supply Commission and the Department of Public Health. It has been necessary to increase the engineering organization about 47 per cent during the year to handle the work of additional surveys and contracts in connection with the proposed pressure aqueduct.

Karl R. Kennison, Assistant Chief Engineer, continued in charge of all studies in connection with the general plan of the work and the design of structures, preparation of contract specifications, contract and working drawings.

Charles L. Coburn and Stanley M. Dore, Associate Civil Engineers, continued their general supervision of the detailed work of the office, and Walton H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages. They have assisted in the preparation of contract specifications.

William W. Peabody, Division Engineer, continued in charge of the Quabbin Reservoir and Aqueduct Division. Two new divisions were established, the Wayland-Weston Division, October 7, in charge of Coleman C. McCully, Division Engineer, and the Southborough-Framingham Division, October 17, in charge of Frederick W. Gow, Division Engineer.

Charles T. Main, consulting engineer of Boston, Thaddeus Merriman, consulting engineer of New York, Warren J. Mead, geologist of Massachusetts Institute of Technology, and other experts were employed from time to time.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1937	Nov. 30, 1938
Headquarters Office, Designing Division	52	46
Coldbrook Office, Quabbin Reservoir and Aqueduct Div.	11	14
Enfield Office, Quabbin Reservoir and Aqueduct Div.	88	98
Marlborough Office, Southborough-Framingham Division	0	19
Natick Office, Wayland-Weston Division	0	45
Total Engineering Force	151	222

The maximum force during the year was 222, during the week ending December 3, 1938. The minimum force was 132, during the week ending April 16 and nine weeks ending June 25. The average force for the year was 148.

OFFICES

The office of the Chief Engineer and Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. The offices of the Quabbin Reservoir and Aqueduct Division in the Ware River intake building in Coldbrook and in the property of the Commonwealth formerly known as the Frances W. Chandler house on Quabbin Road in Enfield, were continued throughout the year. On October 7, the Wayland-Weston Division was established with an office at 35 Main Street, Natick. On October 17, the Southborough-Framingham Division was established with an office at 4 Walker Street, Marlborough. Branch offices were maintained at other locations where work under important contracts was in progress. The laboratories for water analysis and for soil testing were continued in the property of the Commonwealth, formerly known as the Barlow house, in Enfield.

HEADQUARTERS OFFICE

Summary of the Year's Work

Real Estate.—Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 1,482 acres, making a total reported on to date of 86,013 acres. Real estate taking plans were prepared and filed March 28, covering the entire area of 74,886 acres within the general taking line adopted by the Commission September 2, 1937, as shown on a map, Accession 24,665, contained in the special report of the joint board, published as House Document No. 262 of 1938. A summary of all real estate acquired for the Quabbin Reservoir and its sanitary protection is shown in an appended table.

ACQUISITION OF REAL ESTATE FOR QUABBIN RESERVOIR

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1938	10,344
Total to Nov. 30, 1937	69,791
Total to Nov. 30, 1938	80,135

Options outstanding Nov. 30, 1938, include 62 acres outside the general taking line.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 2,072 acres, making a total reported on to date of 23,352 acres.

ACQUISITION OF REAL ESTATE FOR WARE RIVER WATERSHED PROTECTION

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1938	902
Total to Nov. 30, 1937	13,849
Total to Nov. 30, 1938	14,751

Options outstanding Nov. 30, 1938 include 398 acres.

An appended table shows all real estate taking plans prepared and filed during this and previous years.

Water Diversion Damage Claims.—The preparation of data for the use of attorneys in anticipated water diversion cases was continued.

Contracts and Specifications.—Contract 60, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich, was executed January 6.

Plans and specifications were prepared for Contracts 61, 62, 63 and 72, PWA contracts, for clearing portions of the site of Quabbin Reservoir in the towns of Belchertown, Hardwick, New Salem, Pelham, Petersham, Shutesbury and Ware, including areas which were in the former towns of Dana, Enfield, Greenwich and Prescott. Contracts 61, 62 and 63 were executed October 20; and Contract 72, October 25.

Plans and specifications were prepared for Contract 64, a PWA contract, for constructing the service buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre. The contract was executed October 25.

Plans and specifications were prepared for Contract 65, for installing shaft caps and aqueduct control valves and for constructing appurtenant works in the Wachusett outlet building at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston. The contract was executed September 22.

Plans and specifications were prepared for Contract 66, a PWA contract, for constructing regulating dams on the Middle Branch of the Swift River in the Town of New Salem and on the East Branch of the Swift River in the Town of Hardwick and in the former Town of Dana, now Petersham. The contract was executed October 25.

Contracts 68 and 69 were prepared, being agreements with the towns of Rutland and Holden respectively, under which the Commission will sponsor WPA projects, and will furnish the necessary materials, supplies and engineering services, required for the construction of sanitary sewerage systems in these towns. Contract 68 was executed October 3; and Contract 69, August 31.

Plans and specifications were prepared for Contract 73, a PWA contract, for constructing additional inverted pipe siphons on the Weston Aqueduct at Sudbury River and Happy Hollow, in the towns of Framingham and Wayland. The contract was executed November 17.

Plans and specifications were prepared for Contract 74, a PWA contract, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct, in the Town of Southborough. The contract was advertised for the opening of bids on December 15, 1938.

Plans and specifications were prepared for Contract 76, a PWA contract, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. The contract was executed October 21.

Plans and specifications were prepared for Contract 85, a PWA contract, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston. The contract was advertised December 1, 1938, for the opening of bids on December 19.

Plans and specifications were prepared for Contract 88, for furnishing and storing top soil at the site of the Quabbin Dike and the Quabbin Park Cemetery in the Town of Ware. The contract was executed November 3.

Working drawings for Contracts 52, 56, 65 and 66 were prepared and issued.

Inspection and Tests.—E. L. Conwell and Company continued the testing of cement until December 31, 1937, after which time this testing was done by the New England Inspection Bureau, as well as the testing of asphalt waterproofing for use under Contract 52, structural and reinforcing steel furnished under Contract 56, stone for use on Contract 60 and steel castings for valves, pressure relief valve connections and shaft caps to be installed under Contract 65. The Worcester Polytechnic Laboratory continued the testing of concrete cylinders furnished under Contracts 52, 56 and 64. Miscellaneous steel and iron for use on Contract 52, stone and electrical equipment for use on Contract 56, and iron and steel stop shutters, racks, gate valves and travelling crane purchased for installation in the Swift River intake works at Shaft 12 and in the release control works at the main dam were inspected by the engineering force.

Hydrographic Data.—The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was continued in cooperation with that company and the U. S. Geological Survey until it was destroyed by the flood in September.

The gaging station on the Swift River above the intake to the stream control tunnel at the main dam was continued until August 11.

Cooperation with the U. S. Geological Survey in the operation and maintenance of the gaging stations on the Swift River near the outlet of Pottapaug Pond in Hardwick and on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations.

Unprecedented Floods

On September 20 to 26, a flood occurred on the Ware watershed that far exceeded any that has occurred within the memory of the oldest residents. The peak occurred at 11:15 A.M. September 21, being at the rate of about 9,040 million gallons per day, or 145 cubic feet per second per square mile of watershed area. This peak was 2⅓ times the peak reached during the flood of March, 1936. The depth of flow over the diversion dam was 7.28 feet. Since Wachusett Reservoir was full at the time and Quabbin Reservoir not yet ready to begin storage of water, no diversion at the Ware River intake works was made.

A similar unprecedented flow would have occurred on the Swift River at the main dam except for the fact that the East Branch Baffle which was constructed across the East Branch of the Swift River subsequent to the 1936 flood, and recently completed, materially reduced the flow down the East Branch, retaining in storage a quantity estimated at over 4,000 million gallons from about 50 square miles of watershed area. The actual peak flow past the main dam site through the stream control tunnel occurred at 11 A.M., September 22, being at the rate of about 3,580 million gallons per day, or 29.8 cubic feet per second per square mile of watershed area.

A hydrograph of the floods on the Ware River at Coldbrook and on the Swift River at the main dam is appended hereto.

Ware River Diversion

No water was diverted into Wachusett Reservoir. The steel bulkhead and gates, about 2,200 feet west of Shaft 8, prevent any diversion of the Ware River westerly. This bulkhead will be removed upon the completion of Quabbin Reservoir.

Sewage Diversion from Ware River Watershed

The Rutland-Holland Sewer continued in operation. During the fiscal year of the City of Worcester, which includes the 12 months ending December 31, 1938, 57,863,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 29,795,000 gallons came from the U. S. Veterans Hospital.

Investigation of Distribution System

Work was continued in accordance with the requirements of Chapter 48 of the Resolves of 1936, relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District. An engineering report to the joint board, consisting of the Metropolitan District Water Supply Commission and the Department of Public Health, was completed. The board's report, dated December 1, 1937, was filed as required by the resolve and was later published by the Legislature as House Document No. 262 of the year 1938. Following the publication of the report, further studies were made and additional data prepared for the benefit of committees of the Legislature.

Contract 58.—Contract 58, with the Pennsylvania Drilling Company, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, to obtain data for the report, was completed December 3, 1937.

The value of work included in contract estimates during the year was $1,173.54, the final estimate dated December 18, 1937, being for $50,944.65.

Portion of Work Under ~~WPA~~ PWA

Under the provisions of the legislation in Chapter 501 of the Acts of 1938, certain parts of the work necessary to complete Quabbin Reservoir and the Swift supply as well as certain portions of a pressure aqueduct and appurtenances recommended by the joint board in House 262, are being financed with the aid of two grants by the Federal Emergency Administration of Public Works, all which work is required to be completed ready for operation on or before June 30, 1940, as follows:

PWA Docket No. Mass. 1520-*F, Mass. State Project D*-202
Weston Aqueduct siphons, additional pipe lines.
Cleaning and lining existing pipe in these siphons.
Purchase of miscellaneous equipment.

PWA *~~WPA~~ Docket No. Mass.* 1551-*F, Mass. State Project D*-208.
Clearing Quabbin Reservoir site.
Concrete dams to control shallow flowage on the Middle and East branches of the Swift River.
Quabbin Hill Road between main dam and dike.

Service buildings at Ware River intake and Wachusett outlet of Quabbin Aqueduct.
Core borings along pressure aqueduct line.
Pressure tunnel section of the pressure aqueduct under Sudbury Reservoir.
Purchase of precast concrete pipe for cut-and-cover pressure aqueduct.
Construction of cut-and-cover section of the pressure aqueduct from Wachusett Aqueduct terminal chamber to Weston Aqueduct supply mains.
New high-level distributing reservoir.
Purchase of pumps, valves, stop logs and miscellaneous equipment.
Spot Pond by-pass.

Design of Structures

Main Dam and Spillway.—Studies were continued of the materials in the main dam embankment as revealed by tests of samples taken periodically from the embankment, including samples from the observation wells in the interior of the impervious core, as a guide in the proper control of borrow pit materials used in the hydraulic sluicing. Studies were made of the spillway channel, designed to discharge under the stone arch bridge which carries the east access road across the channel.

Dike Embankment.—Studies were made and designs completed for monumental boulders which were selected from rejects at the quarry site and installed in central grass plots at the two ends of the dike.

Main Dam Intake Works.—Studies were continued of the requirements for equipment at the main dam intake. One 48-inch gate valve, one 48 x 72-inch sluice gate and one 3-ton crane were purchased for installation in the intake works. Also, two 36-inch gate valves were purchased for temporary installation in the siphon designed for by-passing the Swift River during the operation of plugging the stream control conduit.

Power Development at Main Dam Outlet Works.—Studies were continued of the requirements of hydroelectric power development at the outlet works downstream from the stream control tunnel at the main dam, and designs were continued for these outlet works. One 60-inch, one 48-inch and three 36-inch gate valves, and one 48-inch, one 24-inch and one 12-inch Dow-disc regulating valves were purchased for installation in the outlet works.

Roads.—Studies were made of the location of a highway between the main dam and dike via Quabbin Hill.

Quabbin Park Cemetery.—Studies and designs were completed for a memorial gateway which was constructed at the entrance to Quabbin Park Cemetery.

Shallow Flowage.—Studies and designs were completed of low dams to maintain the water level in areas of shallow flowage on the margins of Quabbin Reservoir. One dam, on the upper end of the Middle Branch of the Swift River, includes a circular spillway about 135 feet long and 23 feet high with crest at the reservoir flow line, elevation 530. The other dam, on the East Branch below the outlet of Pottapaug Pond, includes a circular spillway about 135 feet long and 17 feet high. The crest is at approximately the elevation of the reservoir flow line but was designed slightly V-shaped in cooperation with the U. S. Geological Survey, which plans to use it as a control for automatic gaging of the flow of the stream.

Shaft 8. *Ware River Intake Works.*—Studies and designs were completed for a service building adjacent to the intake building which will include space for garaging 3 trucks, a greasing pit, storeroom and public toilets.

Shaft 4 *of Quabbin Aqueduct.*—Studies were completed and designs made for a gasoline-driven 2-ton hoist which was purchased and installed in the head house making it unnecessary to continue the unsatisfactory use at this shaft of an automobile hoist.

Quinapoxet River Diversion.—Studies were continued relative to diverting into the aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

Shaft 1. *Wachusett Outlet Works.*—Studies and designs were completed for gates to control the discharge from Quabbin Aqueduct into Wachusett Reservoir. The installation includes a 90-inch shaft cap with 24-inch opening and removable cover, and an extension of the lower of the two 90-inch shaft outlets. Two 72-inch Dow-disc regulating valves in the extension discharge beneath the outer building wall horizontally into Wachusett Reservoir below the water surface. These two valves are designed for slow closure and are in series, one being electrically operated and intended for regular use in controlling the rate of discharge and the other being hand operated and acting as a guard gate. The installation also includes three 24-inch Lombard-type pressure relief valves designed to prevent excessive water hammer in any possible contingency. The upper of the two shaft outlets, to which the penstock of a future water turbine would be connected, is designed to be temporarily closed by a 90-inch cover of the same design as the shaft cap, a 24-inch gate valve and a 24-inch bursting plate.

Wachusett Outlet Buildings.—Studies and designs were completed for a service building adjacent to the shaft outlet building which will include space for garaging 2 trucks, a storeroom, public toilets and a heating plant which can serve the shaft outlet building as well as the service building.

Diversion of Industrial Wastes.—Studies were continued of methods of dispostal of objectionable wastes including diversion into the Rutland-Holden Sewer constructed under Contract 39. Materials and equipment were requisitioned for use on two WPA projects, for which the Commission, as sponsor, will purchase such materials and equipment. One project is for the construction of a sewerage system in the Town of Rutland and the other in the Town of Holden, both of which will discharge into the Rutland-Holden Sewer at three or more points. Studies and designs were made for the layout of these systems and for a measuring station to be installed in the Rutland-Holden Sewer at the Rutland-Holden town line. From this and other existing measuring stations the quantities discharged into the sewer by these two towns can be determined.

Weston Aqueduct Siphons.—Studies and designs were made of additional pipe lines necessary to be added to the Sudbury River and Happy Hollow siphons to bring the Weston Aqueduct up to its designed capacity. The original design included three 7-foot steel pipes in each of these siphons, of which only one was built. Studies indicated that a single additional pipe line in each siphon, 104 inches in diameter and mortar-lined to prevent deterioration will satisfactorily meet the requirements, particularly if the existing pipe is cleaned and lined with cement mortar to prevent further deterioration to restore its original capacity. The aqueduct was unwatered and the pipes in the siphons entered for inspection August 10. The interior was found very badly tuberculated, some of the pits beneath the tubercules being ¼-inch deep. The outside of the pipe was examined in several places and found to be in good condition. The pipe crossing the Sudbury River is constructed as a self-supporting arch in which there are small leaks due to expansion and contraction at the joints. The new pipe is designed to be laid beneath the bed of the river.

Pressure Aqueduct Line.—Studies were made of the location, type and dimensions of a pressure aqueduct and appurtenances to be constructed from the Wachusett Aqueduct terminal chamber in Northborough to the Weston Aqueduct supply mains in Weston, as a part of the proposed plan for pressure distribution to the District. Restrictions on the cost will make it necessary to construct this entire line west of the Charles River, over 18 miles long, as a cut-and-cover surface line with the exception of three miles in tunnel underneath the Sudbury Reservoir. This pressure aqueduct will take its pressure from an equalizing basin at the outlet of Wachusett Aqueduct, the spillway level of which will be about elevation 278.5 above Boston City Base and the normal maximum operating level of which will be about elevation 278. In the line west of the Charles River, will be included a new distributing reservoir in the Town of Weston, the normal maximum operating level of which will be about elevation 272. This is only one foot higher than the flow line of the present Middlesex Fells Reservoir on the northern high service, which can be enlarged and lowered for use in connection with the proposed future tunnel loop under the District, and 11 feet higher than the present Fisher Hill Reservoir of the southern high service. The proposed operation of this future system is described in the report of the joint board, House 262, 1938. Studies of the proposed water supply needs indicate the desirability of constructing that portion of the line east of Sudbury Dam in two stages, that is, as a single line of a diameter smaller than may be required in the future, with provision for a future parallel line, the installation of which could be delayed to an indeterminate extent by temporary pumping under peak load conditions.

Section 1 *of Pressure Aqueduct.*—Studies and designs were made for Section 1 of the pressure aqueduct consisting of (1) the diversion of local drainage from a section of the present open channel, about 2,500 feet long, just downstream from the Wachusett-Aqueduct terminal chamber, which will act as an equalizing basin between the Wachusett grade-line aqueduct and the pressure aqueduct. This basin will have a capacity of about 1½ million gallons per foot of draft. An emergency overflow spillway will be built across the open channel, with crest at about elevation 278.5, discharging into the existing open channel any water released from Wachusett Dam through Wachusett Aqueduct which is not taken into the pressure aqueduct. Drainage channels will be constructed on either side of this equalizing basin and discharge their flows, including heavy flood run-offs, into the existing open channel below the overflow dam; (2) a cut-and-cover aqueduct consisting of about 9,700 feet of 12′-6″ pipe extending from intake works just above the overflow dam to a convenient point on the west side of Sudbury Reservoir and as close to it as topographic conditions will permit. This section of the aqueduct will be constructed practically at the hydraulic grade line. It is designed with connections to permit future extension to Wachusett Reservoir when and if it becomes necessary to supplement the capacity of the existing Wachusett Aqueduct and acordingly is designed to take such additional pressure as it may be required to sustain under such future conditions. Studies indicate the most economical type of satisfactory permanent construction of this line will consist of precast units of steel-cylinder reinforced concrete pipe.

Section 2 *of Pressure Aqueduct. Southborough Tunnel.*—Studies and designs were made for Section 2 of the pressure aqueduct consisting of about 3.0 miles of 14-foot tunnel passing beneath Sudbury Reservoir to a point below the Sudbury Dam. On account of the PWA requirements for early completion, this tunnel is designed to be constructed from four shafts, the maximum distance between shafts being about 1.05 miles. Shaft 1 at the west end is designed as a downtake shaft through which water enters the tunnel from the cut-and-cover aqueduct in Section 1. Shaft 3 is designed to act as an emergency spillway, the overflow being into Sudbury Reservoir. The top of the shaft is designed to permit raising the elevation of this spillway if at some future time the pressure aqueduct is extended westerly to a connection with Wachusett Reservoir.

Shaft 4, at Sudbury Dam, is designed as an uptake shaft to deliver water from the tunnel to the cut-and-cover aqueduct in Section 3. This shaft is very similar in design to Shaft 1 of the existing Quabbin Aqueduct at the point where the latter discharges into the upper end of Wachusett Reservoir. The uptake contains a 108″ x 69″ Venturi meter. It is sealed into the ledge and has two branches at the top, one to the cut-and-cover aqueduct which is proposed to be built at this time and the other permitting connection to a future parallel line, if required. In addition to the wet well, there is also a dry well with a pump chamber at the bottom for unwatering the tunnel. The design of this dry well and pump chamber is very similar to the corresponding one on the Quabbin Aqueduct. In fact, it is planned to use the same 900-horsepower motor lowered into the shaft with a crane in the same way. Two 24-inch pressure relief valves similar in every respect to those on Quabbin Aqueduct will be installed, discharging into the river below the dam. Gates will be provided for regulating the flow to the District through the new pressure aqueduct. The entire works at the shaft head will be housed in a building situated on the grounds just below the dam.

A connection will be provided from the shaft head to the two 60-inch pipes which are now used to conduct the water from two water wheels in the power house on Sudbury Dam to the upper end of Weston Aqueduct. Upon the completion of these connections, and of the additional pipe lines in the Weston Aqueduct siphons, it will be possible in an emergency to utilize the total designed capacity of Weston Aqueduct, supplying water to this aqueduct either from the new pressure tunnel under Sudbury Reservoir, or as at present from the Sudbury Reservoir. It will also be possible in an emergency to supply the new pressure aqueduct directly from Sudbury Reservoir which will be held in reserve for such emergency use. Except for such use of these connections as may be required in emergencies, the supply to the District will come entirely from Wachusett Reservoir through the new pressure aqueduct, and a portion of this supply can be delivered to the District through the existing Weston Aqueduct to such extent as may be found economical in order to utilize the capacity of the existing supply lines to the District from this aqueduct.

Access to the tunnel can be had through manholes provided at Shafts 1 and 4, and also in emergencies from Shafts 2 and 3, the tops of which are designed similar to the construction shafts, 3, 5, 6, 7, 10 and 11 of Quabbin Aqueduct, with removable slabs protected by earth cover and with vents designed to pass air freely but to prevent pollution.

Electric Power for Construction.—Studies were made of the power requirements of contractors, particularly for the construction of the proposed tunnel under Sudbury Reservoir. Agreements were made with the Metropolitan District Commission, New England Power Company and Boston Edison Company for the use of power generated in the District's power plants at Wachusett and Sudbury dams and for supplementary power from the lines of the power companies, at rates which make it possible for the Commission's contractors to obtain electric power at Sudbury Dam at $0.007 per kilowatt hour.

Pressure Aqueduct East of Sudbury Dam.—Studies and designs were made for the pressure aqueduct between the uptake shaft at Sudbury Dam and downtake shaft which will later be constructed near the Charles River. Cost studies were made of various types of construction of large pipe lines. This line as designed will consist of about 13 miles of 11′-6″ pipe, constructed of precast units of steel-cylinder reinforced concrete pipe. This length will be divided into four laying contracts: Section 3, about 3.1 miles from Sudbury Dam to Edgell Road; Section 4, about 3.4 miles further to Old Connecticut Path; Section 5, about 3.4 miles further to Winter Street and Section 6 extending about 0.9 mile further to the proposed distributing reservoir and about 2.2 miles easterly from the reservoir to the river. Section 6 will have in addition to the distributing reservoir a 7-foot diameter connection extending about ⅓ mile north from the aqueduct to the existing Weston Aqueduct supply mains and a short distance still further to the Weston Aqueduct terminal chamber.

This connection will permit delivery direct from Wachusett Reservoir and the discontinuance of the use of Sudbury Aqueduct as soon as this portion of the pressure aqueduct is completed. However, the existing pipe lines from Weston Aqueduct and the distributing reservoirs and supply lines of the southern high service will be taxed to their capacity during the next few years or until the pressure tunnel can be completed from the downtake shaft at the Charles River to Chestnut Hill. Upon such completion, the use of Chestnut Hill Reservoir and pumping at Chestnut Hill can be discontinued. The 7-foot connection between the pressure aqueduct line and Weston Aqueduct also will then provide an emergency connection directly from Weston Aqueduct by way of the pressure tunnel to Chestnut Hill.

Aerial Photographs.—An aerial survey was made of the entire aqueduct line between the Sudbury Dam and the Charles River, scale 1 inch=about 400 feet, and a mosaic map prepared consisting of 5 sheets, each approximately 38 by 33 inches and each covering an area approximately 2.9 by 2.5 miles. The photographs were taken by the 101st Photo Section, 26th Division Air Service, Massachusetts National Guard.

New Distributing Reservoir.—Studies and designs were made for the new distributing reservoir with a capacity of approximately 130 million gallons, or about 13 million gallons in the upper foot. This reservoir with its flow line at about elevation 272 will permit a future connection to be made with a similar reservoir at a slightly lower elevation in the Middlesex Fells as soon as conditions warrant completion of the pressure tunnel loop under the District, as recommended by the joint board in House 262, at which time pumping to the northern high service from Spot Pond can also be discontinued. Until the completion of the pressure tunnel loop, this new distributing reservoir will, by a new pressure tunnel to Chestnut Hill, serve the southern high service with some reinforcement from the Waban Hill and Fisher Hill reservoirs.

Maintenance of Records

Photographic Records.—The taking of moving pictures from time to time to illustrate the progress of the work was continued.

Cemetery Records.—Records of assignment of lots and interments in Quabbin Park Cemetery and of the general removal of bodies from existing cemeteries in the reservoir area were maintained.

Cost Records.—Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements. Time and cost records covering all operations under PWA grants were maintained.

Inventories.—Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

WAYLAND-WESTON DIVISION

The Wayland-Weston Division was established October 7, with headquarters, occupied October 10, in the Hogan Block, 35 Main Street, Natick. This division, until the establishment of the Southborough-Framingham Division on October 17, was in charge of preliminary investigations, surveys, and field work, in connection with the proposed pressure aqueduct east of the Wachusett Aqueduct terminal chamber; and since the establishment of the Southborough-Framingham Division, is in charge of the easterly portion of this aqueduct line consisting of the section east of Edgell Road, Framingham, including the new distributing reservoir in Weston, and also of the construction of additional pipe lines in the Sudbury River and Happy Hollow siphons on the Weston Aqueduct. Prior to the establishment of the division in Natick, temporary field offices for work on the pressure aqueduct line were made available at the terminal chamber of Wachusett Aqueduct and in the caretaker's quarters at Lake Cochituate, through the courtesy of Superintendent Allardice of the Wachusett Division and of Superintendent Aubey of the Sudbury Division, respectively, of the Metropolitan District Commission.

Miscellaneous Office Work

Traverse lines were calculated, reduced, and plotted on the coordinate system previously established by the Metropolitan District Commission for work along the Wachusett and Weston aqueducts. Contour maps were prepared of the areas along the cut-and-cover portions of the pressure aqueduct and at the tunnel shaft heads. Real estate calculations and plans are in progress.

Miscellaneous Field Work

Topography was taken at the four shaft sites of the Southborough Tunnel to determine the areas required for the disposal of tunnel spoil and for the treatment of drainage from the Contractor's operations. The center line of the tunnel was taped, a distance of 3.0 miles, and the surface profile taken, including soundings in Sudbury Reservoir, the tunnel line being carried across Sudbury Reservoir by triangulation. Real estate surveys were made for property takings at the shaft sites and for a strip 50 feet wide along the tunnel line. The surveys included the location of many buildings in Southborough.

Topography was taken of areas on both sides of the open channel for a distance of about one-half mile easterly from the Wachusett Aqueduct terminal chamber.

Topography surveys were completed over about 10.6 miles of the cut-and-cover portions of the pressure aqueduct. Cutting and staking of the line and real estate surveys are in progress. Levels were run at frequent intervals from precise benches previously established by the Metropolitan District Commission along the Weston Aqueduct. Test pits and rod soundings were started and continued during the last week of the year with a labor force which averaged about 7 men.

Progress of Contracts

Contract 73.—Bids were opened November 2, for constructing inverted pipe siphons on the Weston Aqueduct at Sudbury River and Happy Hollow in the towns of Framingham and Wayland. This is a PWA contract. Eight bids were received, four for precast steel-cylinder concrete pipe ranging from $265,832.50 to $440,357.50, and four for steel plate mortar-lined pipe ranging from $309,855.00 to $338,645.00. The contract was executed November 17 with Leo Butler Company, Katonah, New York, the lowest bidder, for precast steel-cylinder concrete pipe. The work contracted for consists of constructing an additional pipe line 102 inches in diameter in each of the two siphons on the Weston Aqueduct. Work was started November 9, and the assembling of the contractor's plant is in progress.

No estimate for payment was made before November 30.

Contract 76.—Bids were opened October 10, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. This is a PWA contract. Four bids were received, ranging from $11,885.00 to $21,700.00. Two were from contractors in Pennsylvania, and one each from contractors in Indiana and Minnesota. The contract was executed October 21 with Sprague and Henwood, Incorporated, Scranton, Pennsylvania, the lowest bidder. The work was begun October 21, since which time four drilling rigs have completed 21 holes at various locations along the line of the cut-and-cover portions of the pressure aqueduct. The contractor's force averaged 5 men.

No estimate for payment was made before November 30.

SOUTHBOROUGH-FRAMINGHAM DIVISION

The Southborough-Framingham Division was established October 17 with headquarters in a building formerly ocupied as a dwelling house at No. 4 Walker Street, Marlborough. This division is in charge of the westerly portion of the proposed pressure aqueduct line consisting of the section between the Wachusett Aqueduct terminal chamber and Edgell Road, Framingham, and including the Southborough Tunnel beneath Sudbury Reservoir. Supervision of this work was taken over from the Wayland-Weston Division which had commenced the investigations and surveys.

Progress was made on surveys and profiles along the aqueduct line. During the last two weeks of the year test pits were dug and rod soundings made with a labor force of 5 men.

QUABBIN RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division, continued in charge of the work on the Ware River watershed, of the maintenance of the Rutland-Holden sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, clearing, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, and of the construction of the main dam, shallow flowage regulating dams, relocated highways, and the group of administration buildings at the main dam.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 50, 52 and 60, monthly estimates for Contract 56, and final estimates for Contracts 47, 50, 53 and 57 were prepared. Additional real estate plans were prepared on miscellaneous properties in the Ware River watershed, final tracings being made of about 3,250 acres, making a total to date of about 10,000 acres. Record tracings of the plans showing the Ware River drainage divide were continued. Following the general taking and the consequent discontinuance of the towns of Dana, Enfield, Greenwich and Prescott, an inventory of town equipment was made and town records checked. Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield. Continuous records of the flow of the Swift River were kept at the main dam site. Work on the record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem was continued and work commenced on the record plans of the Petersham-New Salem Highway. Work was commenced on the plotting of cross sections and profiles, and the preparation of contract drawings for a proposed access highway via Quabbin Hill between the main dam and dike. Photographs of the progress of construction were taken.

Miscellaneous Field Work

Lines and grades were given for construction under Contracts 50, 52, 56, 60, 61, 62, 63, 64, 65, 66, 72 and 88. Surveys were made of ponds involving 134 acres of topography in the Ware River watershed and about 10 acres in the Swift River watershed. Surveys were made for access roads at Shaft 9 of Quabbin Aqueduct and at Quabbin Hill. Periodic readings of the ground water level in numerous test wells were continued during construction operations at the main dam, and similar observations were continued at the dike. The engineering force supervised the work of lettering the monumental boulders placed at the ends of the dike, which work was completed September 26. Between April 6 and June 23 work was done on the layout and construction of a new entrance to Quabbin Park Cemetery by a labor force of the Commission. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct.

Storage buildings were made available near the group of administration buildings by the repair of existing farm buildings in the vicinity by the erection of some new buildings. A deep-well pump was installed and put in operation June 2 to supply water to the administration buildings from the well previously drilled under Contract 59 and now located under the repair shop. A compressed gas installation for the group of administration buildings was completed October 13.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

Quabbin Aqueduct and Ware River Intake Works

A two-ton gasoline-engine-driven multiple-speed hoist, with a lift of 465 feet, was installed at the Shaft 4 head house and completed November 14. The Ware River intake works were maintained ready for operation whenever required.

The 900-horsepower motor for driving the tunnel unwatering pump was lowered into the dry well at Shaft 1 on August 24 and the pump was used periodically thereafter for lowering the water level in the Wachusett outlet building to meet the requirements of the work under Contract 65, hereinafter described. On January 13 the tunnel was entered through Shaft 8 and inspected from the steel bulkhead to Shaft 4. The tunnel was entered at Shafts 9 and 12 at intervals for the purpose of reading weirs.

Rutland-Holden Sewer

Operation.—The Rutland-Holden Sewer was in continuous operation. The entire length of the line and the meter stations at the Rutland State Sanatorium, at the U. S. Veterans Hospital in Rutland, and at the Holden-Worcester boundary line were inspected regularly, weirs and piezometer connections cleaned, records of flow maintained, and necessary repairs made.

Rutland-Center Sewer.—A sewerage system was designed for that portion of Rutland Center which can be drained by gravity into the Rutland-Holden Sewer. All house and cellar elevations and other appurtenant data were obtained and final locations of about 75 manholes and grades were established. Real estate plans were prepared. The area served is divided into three drainage systems, in addition to which a few short trunk lines to the main trunk sewer may be required. System A will in general drain Main Street east and Main Street west together with a loop northerly and westerly around Rutland Center Hill. Provision is made for a connection to take sewage from the Central New England Sanatorium. The sewer serving this district will be approximately 2.1 miles in length, and serve about 50 existing buildings, including the Jewish Sanatorium, Rutland Town Hall and High School. System B will in general drain Maple Avenue. The sewer will be approximately 0.7 mile in length, and serve about 34 existing houses. System C will in general drain Central Tree Road and a portion of Main Street in its vicinity. The sewer will be approximately 1.4 miles in length.

Holden-Center Sewer.—A sewerage system was designed for that portion of Holden Center which can be drained by gravity into the Rutland-Holden Sewer. All house and cellar elevations and other appurtenant data were obtained and final locations of about 98 manholes and grades were established. Real estate plans were prepared. The area served is divided into three drainage systems. System A will in general drain Laurelwood Road, Lovell Road, Walnut Street, Walnut Road, Armington Lane, Hubbard Lane, Highland Street to the summit, a portion of Reservoir Street, and Main Street between Highland Street and Lovell Road. The sewer serving this district will be approximately 1.7 mile in length and serve about 80 existing buildings. System B will in general drain Bancroft Street, Williams Street, Holt Road, Main Street between Highland Street and the easterly end of Boyden Road, Boyden Road, Bascom Parkway, Woodland Road, Phillips Road, and Highland Street between Armington Lane and Woodland Road. The sewer will be approximately 2.1 miles in length and serve about 101 existing buildings. System C will in general drain Salisbury Street north of the Boston & Maine Railroad, and Main Street between Salisbury Street and the easterly end of Boyden Road. The sewer will be approximately 0.6 mile in length and serve about 27 existing buildings.

Wachusett Watershed

Industrial Wastes.—Studies were continued of methods of disposal of manufacturing wastes in the Village of Jefferson in the Town of Holden.

Boylston and West Boylston Sewer.—Preliminary studies were made of the feasibility of collecting and diverting sewage from the towns of West Boylston and Boylston out of the Wachusett watershed.

Ware River Watershed

Maintenance.—A small labor force was employed throughout the year in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 and Shaft 9 head houses, setting stone bounds, reforestation and other miscellaneous work. The average number of men so employed was 6, the maximum being 15 during the week ending May 7.

Reforestation.—Reforestation in the Ware watershel was continued by the planting of transplants from the Commission's nurseries in the Swift River valley and from the State Nursery at Amherst during the spring planting season. The following table summarizes the Ware watershed planting to date:

Year	*Species*	*Type*	*Quantity*
1936	Norway Spruce	6-year transplants	106,560
	White "	5-year transplants	8,625
	" "	4-year transplants	50,000
	European Larch	2-year seedlings	5,550
1937	White pine	4-year transplants	238,500
	Norway spruce	4-year transplants	42,250
	Black spruce	Mixed native seedlings	1,070
	Larch	" " "	363
1938	White pine	4-year transplants	30,000
	Red pine	4-year transplants	43,000
	European Larch	2-year seedlings	46,475
	Total		572,393

Fire Protection.—Forest fire equipment continued to be housed in a building of the Commission near the intake works and was maintained in readiness for service at all times. Four assistants in the Coldbrook office were appointed as deputy fire wardens. The equipment and personnel responded during the year to calls for assistance at 5 forest fires which burned over a total area of 103 acres.

Quabbin Reservoir

Topography.—The taking of topography in the area below the flow line of the reservoir was continued. To date 34,358 acres or 53.7 square miles have been surveyed for the general topographic maps within and adjacent to the proposed reservoir. A small labor force was employed in connection with this work.

Policing.—Subsequent to the general taking and the discontinuance of towns in the reservoir area, police protection was provided in Enfield daily and in Dana Sundays, commencing May 15 and continuing until September 24. Barriers were then erected across all the main roads into the reservoir area with men stationed at all such points to prevent the general use of these roads.

Real Estate.—Properties described in applications by owners for sale of real estate were located, and when no surveys had been made, sketches showing the approximate location were prepared. Properties purchased or taken by eminent domain were plotted on the general property map as the deeds were received and surveys completed. Real estate surveys during the year cover 468 acres, making a total to date of 69,254 acres or 108.2 square miles. Of this total, 68,850 acres have been plotted on a scale of 1 inch=200 feet. The work of computing the general taking line and checking the final real estate taking lines was completed March 28, when the general taking was made.

Photography.—The photographing of buildings, cemetery lots, and construction was continued. During the year 1,175 photographs were taken of miscellaneous views and progress of construction at Quabbin Reservoir, 173 in the Ware River watershed, and 33 on the pressure aqueduct line.

Cemetery Removals.—Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. Removals have been completed from Hamilton Cemetery in Shutesbury, Blue Meadow Cemetery in Belchertown, Cemetery Hill, Woodlawn, Church and Packardsville Church cemeteries in Enfield, Greenwich Cemetery in Greenwich, and Pelham Hollow and Isaac Linzie cemeteries in Prescott. Of the estimated total of 7,500 bodies to be removed, 6,180 have been removed to date. Removals during the year included the soldiers' monument and cannon from the common in Enfield, the Ballou monument, the war memorial and cannon from the common in Dana Center, and the wooden honor rolls from Enfield and Greenwich. These honor rolls are temporarily stored for safekeeping. A memorial tree was set in Quabbin Park Cemetery by the Town of Greenwich May 2.

Removals have been nearly completed from the remaining cemeteries located below the Quabbin Reservoir flow line as follows: Jason Powers Cemetery in Prescott, and Towne, Old North Dana and Pine Grove cemeteries in Dana.

During the year work progressed as shown in the following table:

CEMETERY REMOVALS

		To Nov. 30, 1937*	Year Ending Nov. 30, 1938	Total
Burial lots in Quabbin Park Cemetery assigned in exchange		537	82	619
Burial lots in Quabbin Park Cemetery sold		28	6	34
Number of releases executed of rights in old lots in Quabbin Reservoir area	to Q. P. Cemetery	528	83	611
	to other cemeteries	263	6	269
Bodies removed from Quabbin Reservoir area	to Q. P. Cemetery	3703	1533	5236
	to other cemeteries	921	23	944
Bodies moved from area outside Quabbin Reservoir to Quabbin Park Cemetery		3	1	4
Burials, not reinterments, in Q. P. Cemetery		117	16	133
Headstones moved	to Q. P. Cemetery	2137	766	2903
	to other cemeteries	430	18	448
Monuments moved	to Q. P. Cemetery	297	47	344
	to other cemeteries	148	1	149

*Includes corrections of previously reported data. Quabbin Park Cemetery was not completed for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

The vault was maintained and used from time to time during the winter months. Work of developing Quabbin Park Cemetery included the construction of a new entrance with memorial tablets set in stone gateposts and miscellaneous grading and seeding. Cemetery lots were graded and seeded as removals were completed, and in case of purchases, were graded and seeded at once. The hurricane of September 21 uprooted or broke off practically all of the large pine trees in the cemetery area, damaged several of the hardwood trees, and knocked down or damaged approximately 100 stones. Only three of these stones were damaged beyond repair, the remainder were straightened and reset. Felled trees were limbed and the logs cut in marketable lengths and sold. Stumps were pulled and holes refilled, and all brush burned. An investigation was made of the origin and purpose of all perpetual care funds deposited for the benefit of lots in the discontinued cemeteries. The average force employed on cemetery work during the year was 17 men, the maximum being 36 during the week ending April 23.

Fire Protection.—The fire-fighting equipment was maintained in readiness for service at all times. Eight assistants in the division office were reappointed as deputy fire wardens in the towns affected by the reservoir. The equipment and personnel responded during the year to calls for assistance at 14 forest fires which burned over a total area of about 307 acres. There also occurred a total of 5 fires in buildings, 4 of which were chimney fires resulting in little if any damage. A small labor force was employed to maintain a fire patrol until May 14. The clearing of a 40-foot fire line was continued throughout the year, and included the reclearing of these lines on account of trees blown down by the hurricane of September 21.

Lumbering.—Various lumbermen continued cutting operations under agreements with the Commission for the purchase of standing timber.

Reforestation.—The general program of reforestation was continued with stock from the Commission's nurseries. Watershed planting was started April 4 and completed May 2, on areas outside the flow line and on future islands in the reservoir area. The following table summarizes the Quabbin watershed planting to date not including 100,000 European larch 2-year seedlings used for replacement planting in areas originally planted with pine and Norway spruce in 1935 and 1936.

Year Planted	Species	Type of Transplants	Quantity	Acres Planted	Per Cent of Survival to Date	Cost per M for Planting
1935	White pine	3-year	242,795			
	Red pine	3-year	257,600	420	65-75	$4.50
1936	Norway spruce	5-year	62,000			
	Norway spruce	6-year	145,000	170	40-50	8.47
1937	White pine	4-year	241,000			
	Red pine	4-year	53,000	200	90-95	5.87
1938	White pine	4-year	152,825			
	Red pine	4-year	199,575			
	White spruce	4-year	12,350			
	Red spruce	4-year	9,950			
	Norway spruce	4-year	33,870	275	95-98	6.78
	Total		1,409,965	1,065		

The entire stock was removed from the Thurston Farm Nursery during the spring for planting on the watersheds of Quabbin Reservoir and Ware River and for transplanting in the permanent Belchertown Nursery.

General maintenance work and additional planting was done in the Belchertown Nursery. The following quantities of seed were planted and it is estimated that the number of seedlings and transplants now in this nursery is as follows, not including about 4,000 shrubs of various types:

Species	Pounds of Seed, 1938	1-Year Seedlings	2-Year Seedlings	3-Year Transplants
White pine	50	600,000	700,000	900,000
Red pine	30	600,000	1,000,000	1,300,000
White spruce	5	100,000	175,000	350,000
Red spruce	5	100,000	275,000	100,000
Norway spruce	5	75,000	250,000	175,000
European larch	25	300,000	300,000	10,000
Hemlock	10	50,000	5,000	30,000
Scotch pine	—	——	——	5,000
Total	130	1,825,000	2,705,000	2,870,000

Gypsy moth control work, March 7 to March 26, consisted of cutting and burning infested apple trees in open areas to be reforested.

A labor force of about 18 men was employed for about 37 weeks during the season of work in the nursery and on miscellaneous reforestation work. During the brief period of broad planting, the force used for this purpose averaged 40 men with a maximum of 57.

Clearing Area to be Flooded.—Clearing of about 530 acres extending along the bottom of the valley for about 1½ miles north of the main dam and east of the river was commenced July 1 and continued throughout the year, by a labor force of the Commission, to set a standard for such work to be done by contract on the remaining reservoir area, and to determine the proper cost of such work. The average number of men so employed was 24 the maximum being 44 for the week ending October 1.

Maintenance.—A labor force was employed throughout the year for miscellaneous maintenance work including maintenance of the completed Beaver Brook Dike and access roads. Following the general taking and the consequent discontinuance of the towns of Dana, Enfield, Greenwich and Prescott, janitor service was furnished for the Enfield schoolhouse until the close of the school year, the Enfield sewer system was repaired, highways maintained, and miscellaneous damage caused by the hurricane of September 21 repaired. The average number of men so employed was 13, the maximum being 32 for the week ending November 19.

Soil Testing Laboratory.—The work of exploring, collecting and testing materials to be used in the construction of the main dam together with current control tests of the quality of the material placed in this structure was continued. New equipment was added to the laboratory from time to time to expedite the work. Tests were principally of the permeability, stability and related characterestics of soils affecting their use in hydraulic-fill embankments. Samples from selected borrow areas were collected as required for preliminary testing to determine their suitability for use in the embankments.

Size distribution analyses supplemented by permeability and porosity tests were used for the routine control of the quality of the beach and core materials placed by the full-hydraulic method in the construction of the main dam embankment. Samples were collected daily from the dry-box hopper for sizing tests. The water in the central pool was examined daily for turbidity, as was also the water in the settling basin into which fines from the core were wasted. Samples from the settled core were obtained periodically through the ports of the two observation wells and tested for size gradation and porosity to determine the extent of consolidation. Samples of the core material were also obtained periodically through the ports of the observation well in Beaver Brook Dike and similarly tested. A flush-joint sampler was designed for use in the observation-well work to collect undisturbed samples at a considerable distance from the well.

During the year 16,941 samples were collected, of which 14,458 were tested. Failure of electric power following the hurricane of September 21 was responsible for the large amount of testing awaiting completion. A small labor force was employed in the collecting and handling of samples.

Chemical and Bacteriological Laboratory.—The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued. Regular samples have been collected and sampled from stations on the Ware, Swift, Quaboag and Chicopee rivers. In connection with the comprehensive sanitary survey of the watersheds of the Metropolitan District, under Chapter 48 of the Resolves of 1936, a program of sampling the rivers and their tributaries in the Wachusett and Sudbury watersheds and recording their flows was carried on. The Department of Public Health cooperated in testing methods of treating manufacturing wastes tributary to the Wachusett Reservoir in Holden. The laboratory supervised the treatment of fines wasted from the core pool in the construction of the main dam embankment. Studies and tests were made to determine the corrosive action of soils along the Sudbury River and Happy Hollow siphons on the Weston Aqueduct. A small labor force was employed in the collecting and handling of samples.

Progress of Contracts.

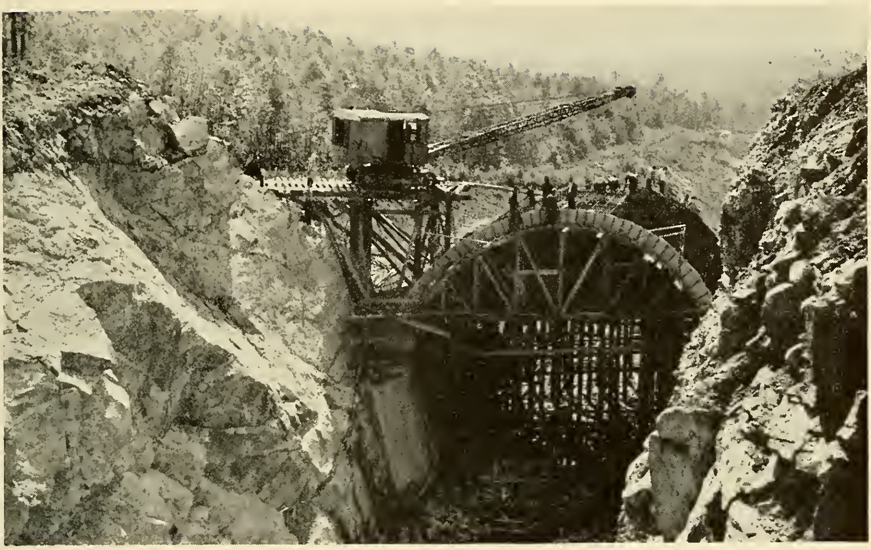
Contract 47.—Contract 47, with Vincent Caira, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich, was carried to completion by the finishing of miscellaneous small items.

The value of work included in contract estimates during the year was $1,104.63, the final estimate dated January 4, 1938, being for $35,744.73.

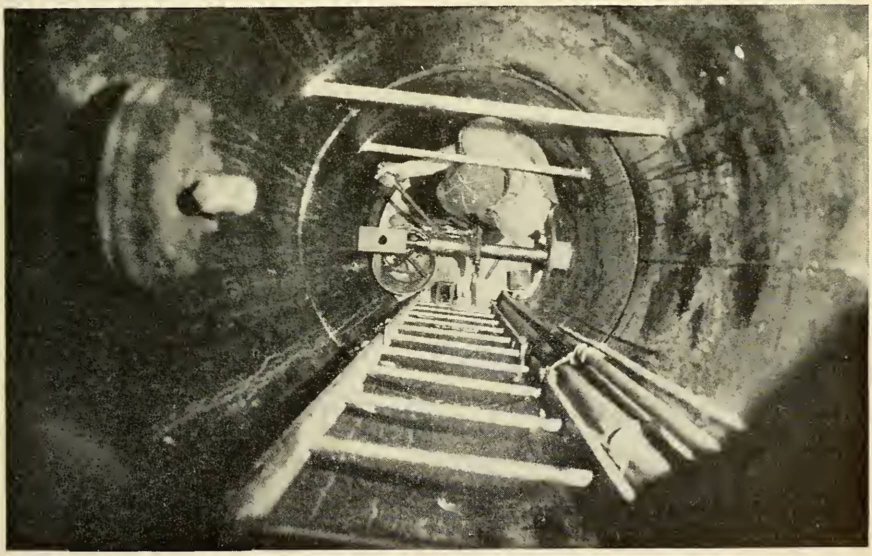
Contract 50.—Contract 50, with the Arthur A. Johnson Corporation, for constructing the embankment of the dike of Quabbin Reservoir in the towns of Enfield and Ware, was completed December 30, 1937, the work consisting of cleaning up the site.

The value of work included in contract estimates during the year was $29,749.57, the final estimate dated November 9, being for $1,402,751.98. The contractor's force averaged 23 men for a period of 5 weeks, the maximum being 36 for the week ending December 18, 1937.

Contract 52.—Contract 52, with Benjamin Foster Company, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware, was continued throughout the year. Before the resumption of hydraulic fill work in the spring, an examination of the core was made by transverse trenches and test pits to locate intrusions of coarse material washed in from the sides of the cut at the west abutment. To correct the conditions found, a trench was excavated about 4 feet wide, 4 feet deep and 700 feet long, 15 feet upstream from the center line of the dam, and unsuitable material in this trench was wasted and replaced by impervious material. The placing of hydraulic fill was resumed April 11. The gravity head from the hog box above the east abutment which had been satisfactory for the construction of the



Contract 52.—Construction of Bridge Across Spillway Channel for Access Road to East End of Main Dam.



Contract 52.—Looking Down One of the Observation Wells which Penetrate the Center of Both the Main Dam and the Dike. Sampling the Compactness of the Core Material.

lower portions of the dam during the preceding year was supplemented by a booster installed just below the hog box, consisting of the 1000-H.P. motor-driven 12,000-g.p.m. 20-inch dredge pump which had been used for a similar purpose in the construction of the dike under a previous contract. Pipe connections were made so that this booster, fed from one section of the hog box, could discharge into the sluice line to either beach. At first it was used only when working at the far ends of the beaches and by-passed the rest of the time. During the latter part of the season it was in continuous operation. The method of placing the hydraulic fill continued the same as last year with the following exceptions:

In August the excess of fines from the borrow pit became so great that the shallowness of the pool interfered with the suction of the barge pumps, and required the construction of a pipe line from the makeup pumps to the east end of the core pool near the pump suctions, and the abandonment of the makeup line which had previously discharged at the west end only. The contractor commenced wasting fines August 31 by means of a 14-inch siphon pipe across the upstream beach near the west end and into a large settling basin about 30 feet deep in the lower portion of last year's borrow pit. This furnished a very large settling capacity and did not overflow until late in October. Another settling basin was then constructed in shallow areas along the side of the river which prevented the discharge of unsettled material into the river. The lower basin was sprayed with aluminum sulphate to precipitate the suspended matter, and the effluent of the upper basin was dosed with an alum solution of about 120 parts per million. In addition to wasting fines, the contractor trucked onto the beaches coarse material consisting of cobbles rejected from the belt conveyors in the borrow areas and of materials excavated from the spillway channel and from a gravel borrow pit south of the spillway.

In order to carry the fill as high as possible by hydraulic methods and to leave additional material on the dam to help bring it to its final grade, the contractor was permitted to temporarily steepen the slopes of the fill above elevation 500. About 20,000 cubic yards of excess fill were thus placed on the slopes to be later picked up with dragline excavators to help top out the structure. The two observation wells for sampling the consolidation of the core were carried up ahead of the fill and all but the top 8-foot steel section of each steel well was placed.

On working days after April 10, there was placed an average of about 7,855 cubic yards per day, the maximum being about 14,500 cubic yards on May 9, and the hours of plant operation averaging about 18. The hydraulic fill portions of the embankment were completed November 24, when operations were shut down for the winter except for preparations to dismantle the hydraulic fill plant. About 1,437,500 cubic yards of hydraulic fill were placed during the year, making a total of 3,402,200 cubic yards including 123,500 cubic yards of selected coarse material for the upstream face.

After the plant shutdown in 1937, the contractor rearranged his equipment so as to secure all his hydraulic fill borrow from the till deposits in the high-level borrow pit about three quarters of a mile northeast of the dam site. The belt conveyor system of the preceding year, except for the main conveyor, was moved to the new location. A dry-box hopper was built in the new area and the till-pit conveyor run from it downhill to discharge onto the lower section of the previous year's main conveyor. A shaker screen was installed at this point to remove large rocks. The new dry box had a trestle from which scraper wagons and shovel-loaded trucks dumped onto coarse racks over a hopper from which the material was fed onto the till-pit conveyor by a short feeder belt. Rejects from the coarse rack were discharged into narrow-gage cars or trucks and were hauled to a waste dump. The dry box was fed by six scrapers and by trucks which were loaded by shovels moved about the pit as necessary to obtain the required quality of material to supplement that excavated by the shovel feeding the swing conveyor. The swing conveyor was similar to that used the previous year except that the units of the supporting trestle consisted of trusses forming a U-shaped section with the conveyor belt in the center and the movable racks riding on rails on the tops of the legs of the U.

At the same time that changes were made in the conveyor system the first of the year, the shuttle conveyor at the hog box was replaced by a wooden trough discharging into either side of the hog box, and powerful jets of water washed the material discharged from the main conveyor down this trough. In the latter part of the season the pump barge in the pool was dismantled and the pumps moved onto a smaller float. In general, the contractor worked three shifts daily and a six-day week on the hydraulic fill and operations closely connected with it, using Sunday for repairs and changes.

After sluicing of the previous year was stopped for the winter, jetting in the pool was continued until January 9 by mounting the jetting rig on runners and working through the ice. When sluicing was resumed, the contractor experimented with a scarifier behind a boat in an attempt to eliminate the necessity for jetting. This did not prove satisfactory and jetting was resumed May 12 and continued until August 3, when the pool became so shallow that the rig could not be floated. Later the rig was rebuilt and jetting was again resumed from November 4 until the end of the sluicing season.

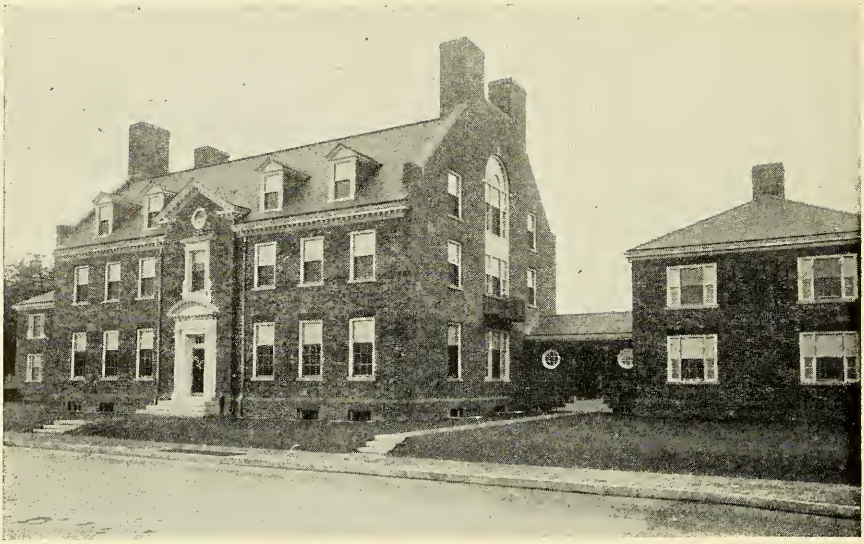
Crushed stone was obtained by crushing and washing rejects from the belt conveyor system. About 10,500 cubic yards were thus furnished and placed in the blanket under the riprap protection of the upstream face. Some of the cobbles and boulders rejected from the conveyor system were trucked onto the upstream face for use as riprap but the greater part of the riprap placed during the year came from the spillway excavation. At the beginning of the year the contractor had constructed a coarse rack against the fill for the access road to the outlet works below the dam. The rejects were carried by narrow-gage cars across the east abuttment and along the upstream levee and were placed as riprap by a crane which picked the bodies off the cars and dumped them. As the embankment was built up a trestle across the east abutment was constructed at a higher elevation and rock excavated from the spillway was chuted into trucks and hauled to the upstream face as riprap. Selected loads of material from the spillway ledge excavation were trucked by way of the main highway to the west end and placed without passing over racks.

Soil dressing was placed on the downstream slope commencing in June. Material was stripped by power shovel from suitable fields, trucked to the berm at elevation 460, dumped off the edge of the berm, spread by small bulldozer and fine graded by hand. By October most of the slope between this berm and the road to the outlet works was completed and seeded. A total of 4,500 cubic yards of soil dressing was placed in this area, and 2.8 acres seeded.

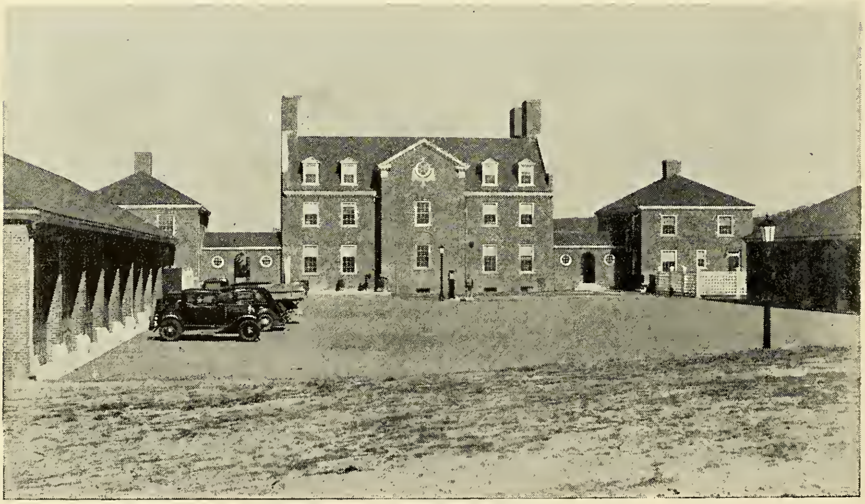
During the period from May 9 to October 26, progress was made on the construction of drop inlets and the laying of pipe in the drainage system on the downstream face and a paved gutter was completed along the intersection of the downstream slope of the dam with the hill at the west end below the berm at elevation 500.

In May the contractor completed the wing walls of the intermediate intake on the upstream face. In July he resumed work on the shaft structure and by August the embankment was high enough to allow him to start the wing walls of the upper intake. These walls were constructed by laying up three courses of stone masonry, building the back form, filling the intervening space with concrete and then repeating the process. Concrete was mixed in a paver on the upstream levee of the hydraulic fill and placed with a bottom-dump bucket handled by a crane. The wing walls were completed and cap stones set October 29. The main portion of the shaft was only three feet below the intake structure floor level at elevation 536 on November 24, when snow and cold weather necessitated shutting down for the season. During the year 1,265 cubic yards of concrete and 182 cubic yards of stone masonry were placed.

Excavation for the spillway channel was continued. The cut through to the face of the cliff, just south of the access road bridge is now well defined but not down to grade for the entire length. In August the contractor built a temporary road down the east slope of the spillway cut at the old Bondsville-Enfield road and excavated ledge in the lower section of the spillway carrying about 100 feet of this cut down to grade. About 30,000 cubic yards of ledge and 6,000 cubic yards of earth were excavated from the spillway channel during the year.



Contract 56.—Administration Buildings, Central Office and East and West Residences.



Contract 56.—Administration Buildings, Rear Courtyard, Garages on Either Side.

The ledge excavation for the abutments of the access road bridge over the spillway was completed and the first concrete placed August 12. Abutments were completed up to the spring line of the arch September 3 and work started on the centering. The ring stones were laid and the concrete in the arch ring was placed October 7. Laying random ashlar for the spandrel walls started immediately and three-foot lifts of the walls themselves were completed as rapidly as the stone was set. Waterproofing of the extrados and inner faces of the spandrel walls was started November 22. When freezing weather shut the job down November 24, the walls were high enough so that it will be possible to place enough fill for the bridge to be used.

In October and November, to build a road onto the downstream beach from the west end and to secure material to build up the beaches, the contractor made the excavation for the west access road from the administration buildings. About 3,000 cubic yards were removed in grading the steep hillside at the west end of the dam above the upstream portal of the diversion tunnel. About 700 cubic yards were excavated for the boathouse ramp, the material being used as backfill over the water supply tank for the administration buildings. Construction of the south wall of the boathouse ramp was started August 6. By August 25 the concrete and the stone masonry, except cap stones of the south wall, and so much of the west wall as was necessary to permit the contractor for the administration buildings to complete his work, were finished. The cap stones of the south wall were all in place September 2.

The value of work included in contract estimates during the year was $654,331.00, or a total to November 15, the date of the latest estimate of $1,568,322.00, of which $1,461,489.80 was approved for payment. The contractor's force averaged about 363 men from the resumption of hydraulic sluicing May 1, to the end of the year, the maximum being 425 for the week ending November 5. Camp facilities have not been provided at the work.

The total electric energy used by the contractor during the year was 5,873,100 kilowatt hours, making a total of 9,637,400 kilowatt hours to date.

Additions to the plan during the year consisted of the dredge pump, motor, 2,000 feet of conveyor and some replacements of tractors and scraper wagons, and some hired equipment.

The total work done and materials furnished to date under the principal items of Contract 52 are as follows:

Earth excavation	119,800	cu. yds.
Rock excavation	44,970	“ “
Consolidated pervious embankment	18,600	“ “
Rolled impervious embankment	1,900	“ “
Embankment by full-hydraulic method	3,278,700	“ “
Miscellaneous embankment	102,400	“ “
Selected coarse material	123,500	“ “
Crushed stone or screened gravel	14,700	“ “
Light riprap	59,300	“ “
Heavy riprap	540	“ “
Soil dressing	5,300	“ “
Furnishing and placing grout	925	“ “
Portland cement	11,100	bbls.
Concrete, Class A	3,630	cu. yds.
Concrete, Class B	2,850	“ “
Reinforcing steel	123,500	pounds
Steel pipe for 68-inch conduit	272,700	“
12, 18 and 24-inch tile pipe	3,805	lin. ft.

Contract 56.—Contract 56, with Rich Bros. Construction Co. Inc., for constructing the administration buildings near the main dam of Quabbin Reservoir in the Town of Belchertown, was continued throughout the year.

Brickwork was continued on the main building, and all brickwork, brick paving, tile and terrazo work was completed October 18. Setting seam-face granite on the front of the boathouse and hangar was started April 13, and all stonework, including cut granite steps, curbing and coping, was completed September 28. Structural steel work was continued and the erection of the roof of the main building was completed January 26. Concrete work was continued, including second and third floor slabs and granolithic floors of the main building, garage floors, boathouse and hangar walls, roof, floor and apron, and was completed September 14.

Gypsum planking was continued in the first and second floors and roofs of the residences and the roof of the main building and completed February 24. Gypsum plank roofs were covered with slate roofing and completed April 15. The concrete roof of the patrol building (boathouse and hangar) was covered with a waterproof membrane embedded in hot asphalt beneath the bituminous paving and was completed July 27. Corkboard insulation was applied to all exterior walls above the basement in the residences and main building and to the ceilings of the boathouse and hangar. Metal lath was installed on the corkboard on all exterior walls, and on furring in ceilings in the residences and the top floor of the main building. Plastering was completed July 15. The second floor ceilings of the residences and third floor ceilings of the main building were insulated with mineral wool and completed May 14.

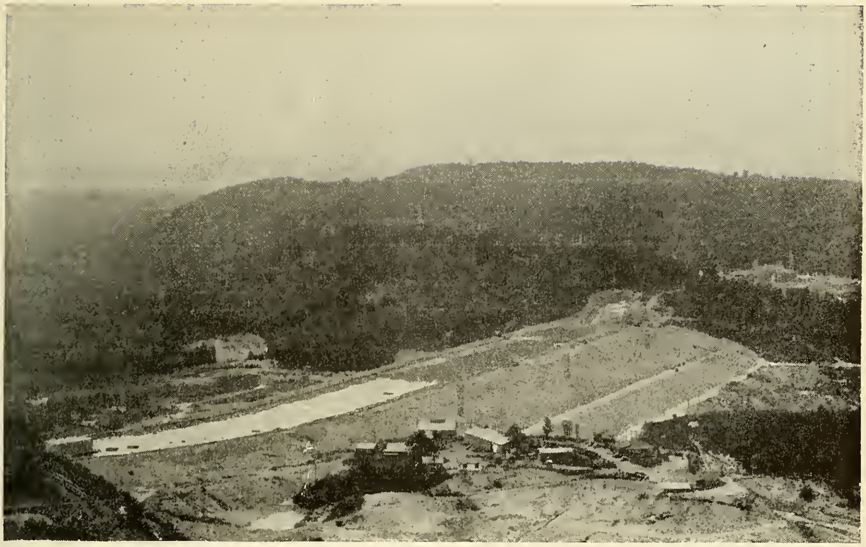
The electrically-operated hangar door was delivered July 6 and erection was completed July 20. Erection of overhead doors in the garages was completed April 15. Laying of rubber floor tile in the residences and asphalt tile and linoleum in the main building was completed October 25. Hardwood floors were laid in the dinings rooms, living rooms, studies and entire second floors of the residences and completed October 19.

The automatic sprinkler system, including a wet pipe system in the main building, dry pipe systems in the garages, boathouse and machine shop, and a deluge system in the hangar, was completed August 5, and the necessary compressed air system was completed at the end of the year. The hot water storage tank, oil-burning hot water heater and gas lines to the laboratory were completed August 16. The heating system, consisting of one coal-burning and one oil-burning boiler, and steam lines to blower units in the boathouse and hangar, and to radiators elsewhere, was completed at the end of the year. The electrical installation, including transformers, switchboard, auxiliary power plant and telephone equipment, was completed at the end of the year. The entire work including grading and seeding and bituminous road surfacing, erecting two flagpoles and other miscellaneous accessories was practically completed at the end of the year.

The value of work included in contract estimates during the year was $285,956.27, or a total to November 29, the date of the latest estimate, of $379,384.39, of which $356,445.95 was approved for payment. The contractor's force averaged 36 men, the maximum being 83 for the week ending December 4, 1937.

Contract 60.—Bids were opened December 2, 1937, for constructing access roads to Shaft 12 of Quabbin Aqueduct, in the towns of Hardwick and Greenwich. Twenty-two bids were received, ranging from $78,348.00 to $145,894.10. The contract was executed January 6 with Middlesex Construction Company, Framingham, Mass., the lowest bidder. The work contracted for consists of a main access road, surfaced with bituminous macadam 20 feet in width, extending easterly from the tunnel intake works at Shaft 12 in the town of Hardwick 2.05 miles to a junction with existing town roads leading to Ware and Hardwick, and of a branch road surfaced with gravel 13 feet in width, extending from the main road across the baffles constructed under Contract 51, to provide access for inspection and fire protection purposes to a large area which would otherwise be isolated north of the East Branch Baffle. This branch road is 0.54 mile long not including the length across the top of the baffles, and has one traffic lane with turnouts permitting passage of two vehicles at intervals of a few hundred feet.

Clearing and grubbing started January 10 and was completed January 28 and rough grading started March 14 and was completed June 10. The macadam surface was constructed on a gravel foundation 12 inches thick which was placed June 4 to 24. The macadam consists of two courses of broken stone, the bottom course 3½ inches bound with sand and the top course 2½ inches penetrated with hot asphalt at the rate of two gallons per square yard, sealed with asphalt at the rate of ⅜ gallons per square yard and bound with ½-inch broken stone. Broken stone was purchased and trucked to the job except for a small amount of tunnel spoil obtained at Shaft 12 and used in the bottom course. The bottom and surface broken stone courses were completed July 27; and the asphalt penetration, August 3. Berm ditches were excavated beyond tops of side slopes in cuts, and all cut slopes and some embankment slopes were rounded, loamed and



Contract 52.—The Main Dam Looking Downstream, when the Embankment had Reached an Elevation 28 Feet Below the Future Flow Line of Quabbin Reservoir. Group of Administration Buildings at Extreme Right.

Contract 60.—Access Road to Shaft 12 on the West Shore Line of the Reservoir at the Entrance to Quabbin Aqueduct.

seeded to reduce future maintenance due to slop erosion. Loam berms were constructed at the shoulders of high embankment slopes as in similar cases under previous contracts. Loam borrow was completed September 27. All work of the contract was completed October 18. This contractor also placed the macadam surface at the memorial gateway to Quabbin Park Cemetery.

The value of work included in contract estimates to October 15, the date of the latest estimate, was $74,682.13, of which 85 per cent was approved for payment. The contractor's force averaged 23 men for a period of 35 weeks, the maximum being 37 for the week ending June 25.

The principal items of plant equipment were as follows:

3 Power shovels
2 Bulldozers
1 Power grader
3 Rollers
2 Trench diggers
11 Trucks, miscellaneous pumps, etc.

The total work done and materials furnished to date under the principal items of Contract 60 are as follows:

Clearing and grubbing	24 acres
Roadway earth excavation	43,800 cu. yds.
Ledge excavation	1,900 " "
Ordinary borrow	12,000 " "
Broken stone for surface course	3,750 tons
Broken stone for base course	2,375 cu. yds.
Bituminous material	62,200 gals.
Gravel borrow	12,360 cu. yds.
Fine grading, rolling and finishing	72,000 sq. yds.
Trench excavation	2,385 cu. yds.
Loam borrow	8,000 " "
Loam berms	1,350 lin. ft.
Peat excavation	1,850 cu. yds.
Boulder guard rail	7,150 lin. ft.
12 to 36-inch reinforced concrete pipe	2,031 " "
6-inch side drains	2,910 " "

Contract 61.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the West Branch of the Swift River in the towns of Belchertown and Pelham, Shutesbury, New Salem and Ware, including areas which were in the former towns of Enfield and Prescott. This is a PWA contract. Five bids were received ranging from $268,700.00 to $482,825.00. The contract was executed October 20, with Coleman Bros. Corp., Boston, Mass., the lowest bidder. The work contracted for consists of clearing the entire West Branch and the main valley west of the Village of Enfield, except a portion at the bottom of the valley lying east of the river and upstream from the main dam which is being cleared by a labor force of the Commission. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 62.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the Lower Middle and East branches of the Swift River in the towns of Ware, New Salem, Petersham and Hardwick, including areas which were in the former towns of Enfield, Prescott and Greenwich. This is a PWA contract. Five bids were received ranging from $344,100.00 to $550,825.00. The contract was executed October 20 with Coleman Bros. Corp., the lowest bidder. The work contracted for consists of clearing the lower portion of the reservoir north of the dike, east of the Village of Enfield, and south of Greenwich Village. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 63.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the central portion of the Middle Branch of the Swift River in the towns of New Salem, Petersham and Hardwick, including areas which were in the former towns of Greenwich, Prescott and Dana. This is a PWA contract. Six bids were received ranging from $217,500.00 to $350,975.00. The contract was executed October 20, with Coleman Bros. Corp., the lowest bidder. The work contracted for consists of clearing a portion of the Middle Branch of the reservoir, extending about four miles northerly from Contract 62. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 64.—Bids were opened August 25, for constructing the service buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre. Subsequently, each of the three lowest bidders agreed to accept his bid price if the necessary provisions were added to the contract to make it a PWA contract. The contract was executed as a PWA contract October 25 with Platt Contracting Co., Inc., Cambridge, Mass., the lowest bidder. The work contracted for consists of constructing a service building adjacent to the existing Wachusett outlet building at Shaft 1 of Quabbin Aqueduct, containing space for garaging two trucks, storeroom, public toilets and a heating plant which can serve the shaft outlet building as well as the service building, also a service building adjacent to the existing Ware River intake building at Shaft 8 of Quabbin Aqueduct, containing garage space for three trucks or automobiles, greasing pit, storeroom and public toilets.

Work started November 7. At Shaft 1, excavation and placing of forms for footings and sidewalls were completed November 21, and reinforcing placed in the sidewalls November 30. Other miscellaneous items were in progress. At Shaft 8 similar work was done, reinforcing being in place November 23 and the footings poured November 30. The contractor's force averaged 12 men for a period of 4 weeks, the maximum being 17 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 65.—Bids were opened September 8, for installing shaft caps and aqueduct control valves and for constructing appurtenant works in the Wachusett outlet building at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston. Five bids were received, ranging from $11,335.00 to $22,685.10. The contract was executed September 22 with the Engineering Service and Construction Co., Boston, Mass., the lowest bidder. The work contracted for consists of installing gates and appurtenances for which provisions were made in the original design of the outlet works, and which are necessary to control and regulate the flow in the aqueduct, to shut off the discharge into Wachusett Reservoir and cause the water diverted from the Ware River to flow westerly in the tunnel to Quabbin Reservoir.

Prior to the contractor's work, the Commission commenced the unwatering operations by installing temporary transformers and lowering its 900-horsepower motor to the bottom of the dry well connecting it to the tunnel unwatering pump. Pumping was started September 6 and continued intermittently as necessary for the work of the contract. The contractor commenced work October 18. Stop logs were placed and sealed and a small gasoline-driven pump was used to complete the unwatering of the outlet chamber to permit thorough cleaning of rock.

The building's bronze entrance doors and frame were removed and temporary wooden doors substituted October 28. The two 72-inch Dow-disc valves, furnished by the Commission, were delivered November 3 and 4, lowered into the pit the next day, placed to line and grade and finally set in concrete November 19. Other work was in progress. The contractor's force averaged 6 men for a period of 7 weeks, the maximum being 8 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 66.—Bids were opened August 25, for constructing regulating dams on the Middle Branch of the Swift River in the Town of New Salem and on the East Branch of the Swift River in the Town of Hardwick and in the former Town of Dana, now Petersham. Eleven bids were received, ranging from $171,650.00 to $294,250.00. Subsequently, each of the three lowest bidders agreed to accept his bid price if the necessary provisions were added to the contract to make it a PWA contract. The contract was executed as a PWA contract October 25 with C. & R. Construction Company, Boston, the lowest bidder. The work contracted for consists of the construction of regulating dams to maintain a practically constant water level over shallow areas in the upper branches of Quabbin Reservoir and of clearing the entire area to be flooded thereby. Work was started November 7 with clearing on the west side of the East Branch of the Swift River. The contractor's force averaged 28, the maximum being 45 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 72.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the Upper Middle and East branches of the Swift River in the towns of New Salem, Petersham and Hardwick, including areas which were in the former towns of Prescott, Greenwich and Dana. This is a PWA contract. Four bids were received, ranging from $469,975.00 to $905,000.00. The contract was executed October 25 with C. & R. Construction Company, the lowest bidder. The work contracted for consists of clearing two portions of Quabbin Reservoir lying north and east of Contract 63, and downstream from the regulating dams to be built under Contract 66. Work of clearing and burning up was started November 7. The contractor's force averaged 49, the maximum being 78 for the last week of the year.

No estimate for payment was made before November 30.

Contract 88.—Bids were opened November 3, for furnishing and storing top soil at the Quabbin Dike and in the Quabbin Park Cemetery in the Town of Ware. Five bids were received, ranging from $7,620.00 to $12,500.00. The contract was executed November 3 with Warner Bros. and Goodwin, Inc., Sunderland, Mass., the lowest bidder. About 2,400 cubic yards of loam was stripped from borrow areas in Enfield and piled ready for removal to the storage areas November 15 to 21, when work was suspended for the season. The work was done by one man operating a Diesel-powered bulldozer.

No estimate for payment was made before November 30.

List of Drawings and Tables Appended Hereto

Location of Real Estate Acquired for Quabbin Reservoir.
Takings of Real Estate and Water Rights.
Status of Contracts Completed between November 30, 1937, and November 30, 1938.
Status of Contracts in Force on November 30, 1938.
Canvass of Bids, Contracts 61 and 62.
Canvass of Bids, Contracts 63 and 72.
Canvass of Bids, Contract 66.
Canvass of Bids, Contract 73.
Hydrographs of the Great Floods of March, 1936, and September, 1938.
Monthly Rainfall at Stations on Ware and Swift Watersheds, 1938.
Substitute Highways in Quabbin Reservoir Area.
Revised Town and County Lines in Quabbin Reservoir Area.

For data on contracts completed prior to November 30, 1937, see sixth to twelfth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1938, see 1935 to 1937 annual reports, inclusive.

Respectfully submitted,

Frank E. Winsor, *Chief Engineer.*

20 Somerset Street, Boston, Mass.
January 3, 1939.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION

New accounts have been opened during the year necessitating transfers from old accounts.

In the case of accounts marked PWA, the cost to the Commonwealth will be decreased by the amount of the federal grant.

GENERAL OVERHEAD

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
ADMINISTRATION, *Commissioners' Office*:		
Salaries, Commissioners	$10,500.00	$127,915.56
Salaries, Clerical	14,527.66	142,076.33
General Legal Expense	3.00	2,172.16
Furniture and Fixtures	314.40	4,883.60
Engineering Instruments	00.00	98.00
Rent and Upkeep	2,282.53	27.583.17
Automobile Purchase	00.00	2,917.93
Automobile Maintenance	313.35	3,597.78
Miscellaneous Expense (undistributed)	2,557.28	19,759.58
Advertising	1,233.83	12,245.40
Printing and Blueprinting	797.88	11,495.38
Stationery and Office Supplies	478.15	3,541.39
Postage	328.08	1,955.13
Total Administration, Commissioner's Office	$33,336.16	$360,241.41
ENGINEERING, *Headquarters' Office*:		
Salaries, Engineering	$78,810.80	$944,476.17
Salaries, Clerical	11,628.41	118,427.54
General Consultant Expense	1,653.25	118,168.50
General Legal Expense	00.00	53,160.29
Furniture and Fixtures	62.07	15,181.51
Laboratory Equipment	00.00	1,961.00
Laboratory Supplies	00.00	2,071.94
Rental of Equipment	00.00	3,370.02
Engineering Instruments	8.33	1,266.37
Rent and Upkeep of Boston Office	10,372.66	126,425.92
Rent and Upkeep of Springfield Laboratory	00.00	3,950.54
Automobile Purchase	00.00	3,604.62
Automobile Maintenance	315.24	4,484.40
Special Experiments	00.00	2,304.63
Miscellaneous Expense (undistributed)	779.67	23,594.50
Printing and Blueprinting	753.19	16,908.58
Stationery and Office Supplies	604.89	6,968.60
Postage	363.00	2,704.48
Total Engineering, Headquarters' Office	$105,351.51	$1,449,029.61

DISTRIBUTION OF GENERAL OVERHEAD

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
ADMINISTRATION, *Commissioners' Office*:		
Wachusett-Coldbrook Tunnel	$8,719.48	$87,123.78
Coldbrook-Swift Tunnel	49.94	29,800.95
Quabbin Reservoir (except PWA) . .	15,513.52	154,006.67
Main Dam	7,099.00	46,606.48
Beaver Brook Dike	468.12	28,584.61
Southern Sudbury Emergency Supply .	00.00	8,690.28
Metropolitan System-General (Expenditures under Chapter No. 48) .	355.91	2,789.67
Cochituate Supply (Expenditures under Chapter No. 18) .	00.00	1,508.78
Wachusett Watershed Protection . .	1,130.19	1,130.19
Quabbin Reservoir (PWA)	84.18	84.18
Weston Aqueduct Siphons	4.54	4.54
Pressure Aqueduct West of High Level Distributing Reservoir	23.26	23.26
Total Administration, Commissioners' Office	$33,448.14	$360,353.39
ENGINEERING, *Headquarters' Office*:		
Wachusett-Coldbrook Tunnel (except PWA)	$27,226.10	$340,478.84
Coldbrook-Swift Tunnel	217.29	113,977.89
Quabbin Reservoir (except PWA) . .	48,789.99	668,531.91
Main Dam	23,415.11	163,946.66
Beaver Brook Dike	1,525.96	106,571.66
Southern Sudbury Emergency Supply .	00.00	33,407.97
Metropolitan System-General (Expenditures under Chapter No. 48) .	1,926.17	15,805.54
Cochituate Supply (Expenditures under Chapter No. 18) .	00.00	4,058.25
Wachusett Watershed Protection . .	2,250.89	2,250.89
Superstructure—Shaft 4—Southboro Tunnel	101.89	101.89
Wachusett-Coldbrook Tunnel (PWA) Service Buildings	74.36	74.36
Quabbin Reservoir (PWA)	1,347.60	1,347.60
Weston Aqueduct Siphons	2,585.39	2,585.39
Pressure Aqueduct West of High Level Distributing Reservoir	10,708.87	10,708.87
High Level Distributing Reservoir in Weston	70.97	70.97
Pressure Aqueduct East of High Level Distributing Reservoir	428.37	428.37
Total Engineering, Headquarters' Office	$120,668.96	$1,464,347.06

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT, WARE SUPPLY (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office .	$8,719.48	$87,123.78
Engineering, Headquarters' Office . .	27,226.10	340.478.84
Total General Overhead	$35,945.58	$427,602.62

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
ENGINEERING:		
Salaries, Engineering and Clerical	$2,855.26	$401,358.85
Consultant Expense	503.13	8,478.00
Labor	614.79	4,652.12
Furniture and Fixtures	0.77	2,307.72
Engineering Instruments	30.56	7,727.80
Rent and Upkeep	1,038.21	19,759.53
Automobile Purchase	00.00	11,578.89
Automobile Maintenance	200.19	15,846.63
Contracts for Investigations and Surveys	00.00	18,640.69
Miscellaneous Expense (undistributed)	171.52	10,157.62
Advertising	00.00	6.05
Printing and Blueprinting	84.47	1,218.17
Stationery and Office Supplies	26.87	3,100.16
Postage	8.94	462.26
Total Engineering	$5,534.71	$505,294.49
REAL ESTATE—*General Construction*:		
Legal and Expert Expense	$00.00	$6,205.35
Consultant Expense	00.00	455.66
Labor	00.00	1,711.20
Miscellaneous Expense (undistributed)	00.00	1,003.60
Printing and Blueprinting	00.00	62.36
Purchases and Settlements	00.00	123,347.50
Taxes	00.00	3,682.24
Maintenance of Real Estate	00.00	1,298.18
Police Protection		
Labor	00.00	41.00
Fire Protection		
Equipment	00.00	1,254.66
Miscellaneous Expense	00.00	00.54
Special Agents		
Salaries	00.00	12,949.00
Furniture and Fixtures	00.00	117.67
Automobile Purchase	00.00	1,222.50
Automobile Maintenance	00.00	2,124.30
Miscellaneous Expense (undistributed)	00.00	1,201.73
Printing and Blueprinting	00.00	26.51
Stationery and Office Supplies	00.00	5.48
Postage	00.00	21.36
Total Real Estate	$00.00	$156,730.84
WARE WATERSHED PROTECTION:		
Salaries, Engineering and Clerical	$9,970.55	$146,115.43
Legal and Expert Expense	814.22	27,853.16
Consultant Expense	00.00	763.70
Labor	4,342.33	19,244.87
Engineering Instruments	8.55	415.65
Rent and Upkeep	139.90	554.51
Furniture and Fixtures	0.26	63.18
Completed Contracts Nos. 27 and 39	00.00	243,104.18
Automobile Purchase	—60.00	1,182.53
Automobile Maintenance	800.61	6,273.41
Special Experiments	00.00	700.00
Compensation to Labor for Injuries	00.00	774.85

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Medical and Surgical Supplies	00.00	200.00
Medical and Surgical Services	11.00	11.00
Miscellaneous Expense (undistributed)	169.69	5,921.69
Printing and Blueprinting	119.82	846.66
Stationery and Office Supplies	127.47	502.32
Advertising	00.00	2.00
Postage	23.54	74.09
Installed Equipment	00.00	5,610.75
Rental of Equipment	00.00	2.50
Purchases and Settlements	19,741.10	1,360,724.91
Taxes	5,054.54	53,099.42
Maintenance of Real Estate	1,516.21	10,829.49
Special Agents		
Salaries	2,520.00	12,168.67
Automobile Purchase	856.67	1,478.67
Automobile Maintenance	418.21	2,335.29
Miscellaneous Expense (undistributed)	255.48	1,465.74
Printing and Blueprinting	00.00	167.40
Stationery and Office Supplies	4.20	8.11
Postage	00.00	23.55
Labor	00.00	15.00
Police Protection		
Labor	00.00	64.00
Fire Protection		
Equipment	00.00	39.09
Labor	147.35	147.35
Auto Maintenance	4.25	4.25
Miscellaneous Expense	0.78	0.78
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing State Sanatorium Branch	55.92	533.99
U. S. Vet. Hospital Branch	65.76	582.46
Trunk Sewer, except Branches	213.24	1,504.40
Use of City of Worcester's Sewerage System for Disposal of Sewage from Rutland-Holden Sewer	402.46	1,177.56
Reforestation, Watershed Planting		
Trees for Watershed Planting	00.00	1,521.89
Labor	1,009.19	1,009.19
Fire Stops and Fire Access Roads	2,794.43	2,794.43
Total Ware Watershed Protection	$51,527.73	$1,911,912.12

WARE DIVERSION DAMAGES—EXCEPT AWARDS BY COURT DECREE:

Salaries, Engineering and Clerical	$1,664.08	$86,338.33
Legal and Expert Expense	00.00	3,177.15
Consultant Expense	00.00	22,537.61
Labor	61.20	2,495.68
Furniture and Fixtures	00.00	30.73
Laboratory Equipment	7.19	287.30
Laboratory Supplies	30.75	464.19
Engineering Instruments	00.00	560.34
Rental of Equipment	00.00	203.75
Rent and Upkeep	46.30	90.49
Automobile Purchase	0.50	170.92
Automobile Maintenance	29.76	4,030.41
Medical and Surgical Supplies	0.25	0.25
Contracts for Investigations and Surveys	00.00	63.27
Materials of Construction	00.00	136.51

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Miscellaneous Expense (undistributed)	6.53	7,345.99
Printing and Blueprinting	00.00	1,261.10
Stationery and Office Supplies	00.00	64.10
Postage	00.00	6.62
Purchases and Settlements	00.00	196,633.33
Sub Total Ware Diversion Damages—Except Awards by Court Decree	$1,846.56	$325,898.07
WARE DIVERSION DAMAGES—AWARDS BY COURT DECREE:		
JURY VERDICTS:		
Salaries, Engineering and Clerical	$00.00	$61,087.46
Legal Expense	00.00	37,806.71
Consultant and Engineering Expert Expense	00.00	92,969.39
Expert and Other Witness Expense	00.00	63,740.91
Automobile Maintenance	00.00	440.58
Miscellaneous Expense (undistributed)	00.00	7,526.44
Printing and Blueprinting	00.00	682.98
Stationery and Office Supplies	00.00	146.83
Postage	00.00	19.63
Settlements	00.00	260,000.00
Payments under Certificates of Judgment	00.00	560,458.62
Sub Total Ware Diversion Damages—Awards by Court Decree—Jury Verdicts	$00.00	$1,084,879.55
WARE DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR REIMBURSEMENT FOR EXPENSES OF LITIGATION IN COUNTY COURTS:		
County of Hampshire	$00.00	$15,000.00
Total Ware Diversion Damages	$1,846.56	$1,425,777.62
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$00.00	$9,629,739.99
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Engineering Instruments	$17.40	$17.40
Installed Equipment	1,516.90	64,583.33
Temporary Equipment	00.00	6,423.60
Labor except Contracts	665.34	5,081.03
Compensation to Labor for Injuries	$00.00	$18.29
Contracts for Equipment for Surveys	00.00	898.34
Maintenance of Partially Completed Structures	4,176.43	15,751.03
Maintenance of Grounds	29.25	5,643.94
Purchases of Plants, Trees and Shrubbery	00.00	842.58
Rental of Equipment	00.00	7.00
Miscellaneous Expense (undistributed)	475.29	9,929.13
Printing and Blueprinting	51.54	51.54
Stationery and Office Supplies	1.71	1.71
Materials of Construction	00.00	25.87
Sub Total Except Construction Contracts	$6,933.86	$109,274.79
Total Permanent Construction	$6,933.86	$9,739,014.78
Total Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct, Ware Supply (except PWA)	$101,788.44	$14,166,332.47

Wachusett-Coldbrook Tunnel (PWA Only) Service Buildings

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
General Overhead:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	74.36	74.36
Total General Overhead	$74.36	$74.36
Engineering:		
Salaries, Engineering and Clerical	$671.72	$671.72
Consultant Expense	32.48	32.48
Total Engineering	$704.20	$704.20
Total Wachusett-Coldbrook Tunnel, Service Buildings (PWA)	$778.56	$778.56
Total Wachusett-Coldbrook Tunnel, Ware Supply	$102,567.00	$14,167,111.03

Wachusett Watershed Protection

General Overhead:		
Administration, Commissioners' Office	$1,130.19	$1,130.19
Engineering, Headquarters' Office	2,250.89	2,250.89
Total General Overhead	$3,381.08	$3,381.08
Engineering:		
Salaries, Engineering and Clerical	$7,085.86	$12,628.39
Legal Expense	167.92	171.47
Labor	619.37	1,319.61
Engineering Instruments	9.00	9.00
Automobile Maintenance	264.07	464.25
Miscellaneous Expense (undistributed)	258.91	524.84
Printing and Blueprinting	29.84	49.75
Stationery and Office Supplies	17.59	17.59
Postage	6.79	12.74
Rent and Upkeep	38.50	38.50
Medical and Surgical Services	206.00	206.00
Total Engineering	$8,703.85	$15.442.14
Total Wachusett Watershed Protection	$12,084.93	$18,823.22

Coldbrook-Swift Tunnel Section of Quabbin Aqueduct

General Overhead:		
Administration, Commissioners' Office	$49.94	$29,800.95
Engineering, Headquarters' Office	217.29	$113,977.89
Total General Overhead	$267.23	$143,778.84
Engineering:		
Salaries, Engineering and Clerical	$1,936.84	$268,859.08
Consultant Expense	00.00	586.73
Labor	191.50	2,690.80
Furniture and Fixtures	00.00	1,567.40
Engineering Instruments	00.00	4,577.18

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Rent and Upkeep	169.42	10,826.53
Rental of Equipment	00.00	3.00
Automobile Purchase	—297.31	7,713.21
Automobile Maintenance	116.28	18,145.59
Contracts for Investigations and Surveys	00.00	13,525.66
Materials of Construction	00.00	2.25
Miscellaneous Expense (undistributed)	55.76	8,125.58
Printing and Blueprinting	4.44	959.95
Stationery and Office Supplies	15.62	2,206.03
Postage	3.64	529.45
Medical and Surgical Services	13.00	13.00
Total Engineering	$2,209.19	$340,331.44
REAL ESTATE:		
Legal and Expert Expense	$00.00	$3,103.53
Labor	00.00	12.20
Miscellaneous Expense (undistributed)	00.00	27.16
Printing and Blueprinting	00.00	34.87
Postage	00.00	5.68
Purchases and Settlements	00.00	23,610.00
Taxes	00.00	724.77
Maintenance of Real Estate	00.00	252.79
Fire Protection Equipment	00.00	60.86
Total Real Estate	$00.00	$27,831.86
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contract No. 20	$00.00	$4,809,852.83
Contract 47, Head House at Shaft 12	19,564.97	19,564.97
Contract No. 53, Head House at Shaft 9	1,666.73	9,785.63
Sub Total Construction Contracts	$21,231.70	$4,839,203.43
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$132.50	$445.45
Installed Equipment	17,653.90	24,892.26
Water Supply System	00.00	3,417.56
Miscellaneous Expense	43.71	2,590.91
Sub Total Except Construction Contracts	$17,830.11	$31,346.18
Total Permanent Construction	$39,061.81	$4,870,549.61
COLDBROOK-SWIFT DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Purchases and Settlements	$1,000.00	$3,800.00
COLDBROOK-SWIFT DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	$30.90	$30.90
Legal Expense	1,511.83	1,553.83
Expert and Other Witness Expense	96.50	96.50
Sub Total Coldbrook-Swift Damages—Awards by Court Decree—Jury Verdicts	$1,639.23	$1,681.23
Total Coldbrook-Swift Damages	$2,639.23	$5,481.23
TOTAL COLDBROOK-SWIFT TUNNEL	$44,177.46	$5,387,972.98

QUABBIN RESERVOIR (PWA ONLY)

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$84.18	$84.18
Engineering, Headquarters' Office	1,347.60	1,347.60
Total General Overhead	$1,431.78	$1,431.78
QUABBIN RESERVOIR CLEARING—PWA ONLY—ENGINEERING:		
Salaries, Engineering and Clerical	$5,261.43	$5,261.43
Consultant Expense	64.03	64.03
Total Quabbin Reservoir Clearing—PWA Only—Engineering	$5,325.46	$5,325.46
QUABBIN HILL ROAD—PWA—ENGINEERING:		
Salaries, Engineering and Clerical	$3,705.81	$3,705.81
Labor	202.50	202.50
Total Quabbin Hill Road—PWA—Engineering	$3,908.31	$3,908.31
REGULATING DAMS—PWA—ENGINEERING:		
Salaries, Engineering and Clerical	$1,114.32	$1,114.32
Total Regulating Dams—PWA—Engineering	$1,114.32	$1,114.32
Total Quabbin Reservoir—PWA Only	$11,779.87	$11,779.87

QUABBIN RESERVOIR NOT INCLUDING MAIN DAM AND DIKE (EXCEPT PWA)

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$15,513.52	$154,006.67
Engineering, Headquarters' Office	48,789.99	668,531.91
Total General Overhead	$64,303.51	$822,538.58
ENGINEERING:		
Salaries, Engineering and Clerical	$80,372.12	$569,952.41
Consultant Expense	891.16	4,252.18
Labor	8,690.81	34,550.59
Legal Expense	4.06	4.06
Compensation to Labor for Injuries	45.77	52.63
Furniture and Fixtures	00.00	3,232.21
Laboratory Equipment	71.96	2,386.49
Laboratory Supplies	306.69	4,496.68
Rental of Equipment	00.00	16.75
Engineering Instruments	163.20	6,475.11
Rent and Upkeep	2,342.43	15,803.08
Medical and Surgical Supplies	11.41	11.41
Medical and Surgical Services	86.50	91.50
Automobile Purchase	1,092.56	23,075.52
Automobile Maintenance	4,913.66	29,081.21
Special Experiments	00.00	422.80
Contracts for Investigations and Surveys	00.00	14,683.87
Office Buildings	00.00	5,059.20
Miscellaneous Expense (undistributed)	2,215.39	10,966.27
Printing and Blueprinting	471.42	3,440.39
Stationery and Office Supplies	617.87	7,944.56
Postage	283.16	1,972.08
Total Engineering (except PWA)	$102,580.17	$737,971.00

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:		
Legal and Expert Expense	$12,392.78	$182,843.15
Consultant Expense	00.00	146.78
Labor	2,169.85	19,608.97
Compensation to Labor for Injuries	47.76	113.43
Furniture and Fixtures	00.00	46.06
Medical and Surgical Services	85.00	85.00
Automobile Maintenance	408.43	767.51
Miscellaneous Expense (undistributed)	1,514.97	10,167.32
Advertising	00.00	208.66
Printing and Blueprinting	220.22	1,651.92
Purchases and Settlements	406,857.39	6,941,507.27
Purchase price B. & A. R. R. and N. Y. C. lessee, for part of Athol Branch and general release of all claims for damages for reservoir construction	00.00	641,240.88*
Taxes	73,286.17	469,646.47
Maintenance of Real Estate	1,363.07	11,301.15
Water Supply System	00.00	48.60
Fire Protection		
Equipment	00.00	5,622.00
Automobile Purchase	00.00	771.69
Automobile Maintenance	53.74	425.26
Labor	1,898.58	7,043.38
Medical and Surgical Services	20.00	20.00
Compensation to Labor for Injuries	00.00	10.00
Miscellaneous Expense	38.79	296.55
Police Protection		
Labor	3,246.05	3,455.05
Special Agents		
Salaries	2,520.00	25,466.00
Equipment	00.00	118.33
Labor	00.00	30.00
Automobile Purchase	381.67	2,240.63
Automobile Maintenance	485.10	4,330.33
Miscellaneous Expense (undistributed)	234.65	1,790.58
Printing and Blueprinting	00.00	52.72
Stationery and Office Supplies	9.44	23.12
Postage	1.50	18.57
Renting Agents		
Salaries	2,880.00	29,408.10
Legal Expense	1,004.32	1,170.57
Furniture and Fixtures	00.00	29.29
Automobile Purchase	381.66	906.61
Automobile Maintenance	271.87	584.51
Labor	00.00	69.50
Miscellaneous Expense (undistributed)	92.20	1,026.06
Printing and Blueprinting	00.00	18.62
Stationery and Office Supplies	8.76	47.04
Postage	68.55	285.69
Payments to Towns	00.00	20,500.00
Sub Total Real Estate—Except Awards by Court Decree	$511,942.52	$8,385,143.37

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*Includes interest on settlement of $575,000.00, which settlement was approved and scheduled by Commission on March 29, 1935, and shown in 1935 expenditures although payment was disapproved by Governor and Council and warrant returned to Comptroller's bureau. Rescheduled by Commission with interest on March 4, 1937, in accordance with judgment received from Superior Court, February 15, 1937.

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Salaries of Referees	$00.00	$21,140.00
Salaries, Engineering and Clerical	5.78	1,455.16
Legal Expense	3,002.40	14,354.22
Consultant and Engineering Expert Expense	00.00	2,545.50
Expert and Other Witness Expense	14,445.33	22,165.40
Automobile Maintenance	00.00	6.53
Expenses of Board of Referees	00.00	764.30
Miscellaneous Expense	00.00	591.91
Printing and Blueprinting	00.00	21.99
Stationery and Office Supplies	00.00	23.72
Payments Under Certificate of Judgment	00.00	179,041.67
Sub Total Real Estate—Awards by Court Decree—Board of Referees	$17,453.51	$242,110.40
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	$00.00	$27.73
Legal Expense	503.10	1,061.00
Miscellaneous Expense	35.00	37.00
Payments under Certificates of Judgment	13,045.99	20,878.65
Expert and Other Witness Expense	4.80	4.80
Sub Total Real Estate—Awards by Court Decree—Jury Verdicts	$13,588.89	$22,009.18
Total Real Estate	$542,984.92	$8,649,262.95
QUABBIN RESERVOIR DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering	$39.00	$87.68
Legal and Expert Expense	00.00	931.00
Consultant Expense	00.00	2,158.82
Miscellaneous Expense (undistributed)	00.00	15.19
Printing and Blueprinting	00.00	2.96
Purchases and Settlements	340.00	48,681.00
Sub Total Quabbin Reservoir Damages—Except Awards by Court Decree	$379.00	$51,876.65
QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Legal Expense	$200.89	$200.89
Expert and Other Witness Expense	40.00	40.00
Sub Total Quabbin Reservoir Damages—Awards by Court Decree—Board of Referees	$240.89	$240.89
Total Quabbin Reservoir Damages	$619.89	$52,117.54
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering and Clerical	$6,244.28	$92,384.29
Legal and Expert Expense	00.00	5,814.80
Consultant Expense	316.02	71,200.91
Labor	551.37	2,086.47
Medical and Surgical Supplies	2.20	2.20
Furniture and Fixtures	00.00	78.18
Laboratory Equipment	64.78	2,199.90
Laboratory Supplies	275.98	3,938.46

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Engineering Instruments	00.00	762.98
Rent and Upkeep	416.39	829.42
Rental of Equipment	00.00	10.50
Automobile Purchase	4.50	1,538.22
Automobile Maintenance	261.46	4,495.82
Contracts for Investigations and Surveys	00.00	569.47
Materials of Construction	00.00	18.99
Miscellaneous Expense (undistributed)	58.49	6,248.31
Printing and Blueprinting	18.03	1,085.48
Stationery and Office Supplies	00.00	85.68
Purchases and Settlements	00.00	1,225,650.00
Sub Total Swift Diversion Damages—Except Awards by Court Decree	$8,213.50	$1,419,000.08
BEAVER BROOK DIVERSION DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	$00.00	$488.90
Legal Expense	00.00	3,303.27
Consultant and Engineering Expert Expense	00.00	2,815.05
Expert and Other Witness Expense	00.00	6,350.00
Automobile Maintenance	00.00	104.94
Miscellaneous Expense (undistributed)	00.00	328.48
Printing and Blueprinting	00.00	22.18
Stationery and Office Supplies	00.00	19.55
Postage	00.00	1.00
Payments under Certificates of Judgment	00.00	9,985.53
Sub Total Beaver Brook Diversion Damages—Awards by Court Decree—Jury Verdicts	$00.00	$23,418.90
Total Swift Diversion Damages (including Beaver Brook)	$8,213.50	$1,442,418.98
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, TOWN OBLIGATIONS:		
Town Obligations:		
Town of Enfield	$6,322.43	$6,322.43
Town of Greenwich	3,624.00	3,624.00
Town of Prescott	1,730.29	1,730.29
Town of Dana	7,502.25	7,502.25
Sub Total, Town Obligations	$19,178.97	$19,178.97
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, LIQUIDATING EXPENSES:		
Liquidating Expenses:		
Salaries, Engineering	$501.75	$501.75
Legal and Expert Expense	732.66	732.66
Labor	904.49	904.49
Miscellaneous Expense	55.50	55.50
Automobile Maintenance	49.42	49.42
Sub Total, Liquidating Expenses	$2,243.82	$2,243.82
Total, Quabbin Reservoir, Liquidation of Towns	$21,422.79	$21,422.79
QUABBIN RESERVOIR—CEMETERIES—QUABBIN PARK CEMETERY CONSTRUCTION:		
Salaries, Engineering and Clerical	$1,422.40	$13,774.67
Legal and Expert Expense	455.00	520.00
Consultant Expense	149.55	274.55

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Labor	10,402.30	34,879.20
Tools and Equipment	30.42	502.69
Automobile Purchase	500.00	4,192.88
Automobile Maintenance	714.48	3,000.91
Rental of Equipment	00.00	33.19
Purchases and Settlements	00.00	8,850.00
Construction Materials	765.06	2,984.83
Purchase and Planting of Trees and Shrubbery	00.00	218.93
Receiving Vault	00.00	2,768.85
Water Supply System	00.00	1,251.97
Maintenance of Grounds	6,185.22	15,770.31
Miscellaneous Expense (undistributed)	491.07	1,675.15
Printing and Blueprinting	4.60	188.30
Stationery and Office Supplies	00.00	27.20
Medical and Surgical Services	8.00	8.00
Completed Contract No. 34	00.00	7,842.94
Compensation for Labor for Injuries	31.84	69.27
Sub Total Quabbin Park Cemetery Construction	$21,159.94	$98,833.84
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:		
Salaries, Engineering and Clerical	$4,565.85	$16,676.44
Tools and Equipment	180.34	684.63
Automobile Purchase	00.00	2,669.99
Automobile Maintenance	558.15	2,428.85
Removal and Reinterment of Bodies	6,261.14	26,482.20
Removal and Resetting of Monuments	3,409.33	16,017.60
Miscellaneous Expense	00.00	6.75
Rental of Equipment	00.00	10.50
Sub Total Removals to Quabbin Park Cemetery	$14,974.81	$64,976.96
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUABBIN PARK:		
Salaries, Engineering and Clerical	$221.74	$6,572.23
Tools and Equipment	00.00	15.43
Automobile Purchase	00.00	380.00
Automobile Maintenance	00.00	155.73
Purchases and Settlements	140.00	7,841.60
Perpetual Care Fund Contributions	00.00	175.00
Removal and Reinterment of Bodies	139.98	7,513.27
Removal and Resetting of Monuments	84.53	6,404.41
Miscellaneous Expense	00.00	123.51
Sub Total Removals to Other Cemeteries	$586.25	$29,181.18
Total Quabbin Reservoir Cemeteries	$36,721.00	$192,991.98
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 47, Construction of Service Building and Head House at Shaft 12	-$15,496.33	$15,679.76
Completed Contract No. 49, Excavation of Diversion Channels	00.00	84,789.69
Completed Contract No. 51, Construction of East Branch Baffle	00.00	189,545.99

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Contract No. 56, Construction of Administration Buildings at Main Dam	272,360.64	356,445.95
Completed Contract No. 59, Drilling a Well for Water Supply at Administration Buildings	00.00	691.28
Contract No. 60, Access Road to Shaft No. 12	58,485.85	58,485.85
Sub Total Construction Contracts	$315,350.16	$705,638.52
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:		
Salaries, Engineering	$00.00	$3,206.50
Legal Expense	1,686.06	3,831.51
Miscellaneous Expense	00.00	314.98
Consultant and Engineering Expert Expense	5,757.65	5,757.65
Sub Total Awards by Court Decree—Actions for Breach of Contract	$7,443.71	$13,110.64
OTHER PERMANENT CONSTRUCTION—EXCEPT CLEARING:		
Installed Equipment	$2,314.68	$3,817.39
Furniture and Fixtures	34.90	34.90
Labor	575.01	2,257.51
Compensation to Labor for Injuries	71.64	279.74
Medical and Surgical Services	54.50	54.50
Automobile Maintenance	2.25	2.25
Materials of Construction	293.00	293.00
Miscellaneous Expense (undistributed)	729.80	1,407.18
Printing and Blueprinting	2.50	26.78
Sub Total Other Construction—Except Clearing	$4,078.28	$8,173.25
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:		
Tools and Equipment	$7.36	$22,772.12
Labor	00.00	1,721,299.70
Compensation to Labor for Injuries	7,866.03	37,652.96
Miscellaneous Expense (undistributed)	6.00	2,749.65
Printing and Blueprinting	00.00	69.76
Stationery and Office Supplies	00.00	1,029.84
Postage	00.00	186.71
Automobile Purchase	—297.31	11,734.22
Automobile Maintenance	00.00	5,404.67
Furniture and Fixtures	00.00	877.65
Rent and Upkeep	00.00	826.98
Medical and Surgical Equipment	126.90	299.72
Medical and Surgical Supplies	00.00	2,023.67
Medical and Surgical Services	515.00	14,073.13
Fire Protection		
Equipment	00.00	425.87
Miscellaneous Expense	00.00	132.72
Labor	00.00	4,175.00
Legal Expense	1,384.40	5,669.83
Sub Total 1936 Clearing Project	$9,608.38	$1,831,404.19
OTHER PERMANENT CONSTRUCTION—RESERVOIR CLEARING (EXCEPT PWA) NOT INCLUDING 1936 CLEARING PROJECT:		
Labor	$14,875.27	$38,724.07
Miscellaneous Expense (undistributed)	218.08	218.08

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Printing and Blueprinting	39.11	39.11
Stationery and Office Supplies	111.45	111.45
Advertising	261.41	261.41
Medical and Surgical Services	146.00	146.00
Tools and Equipment	144.73	144.73
Automobile Purchase	776.44	776.44
Automobile Maintenance	93.47	93.47
Sub Total Reservoir Clearing (Except PWA) Not Including 1936 Clearing Project	$16,665.96	$40,514.76
Total Quabbin Reservoir Permanent Construction	$353,146.49	$2,598,841.36
HIGHWAY AND PUBLIC UTILITY RELOCATION:		
Salaries, Engineering and Clerical	$6,945.98	$218,700.27
Legal and Expert Expense	00.00	49.10
Consultant Expense	00.00	9,117.56
Labor	1,229.36	12,691.52
Furniture and Fixtures	00.00	61.74
Completed Contracts Nos. 21, 40, 41, 43, 44, 54 and 55	00.00	1,010,622.27
Contract 57, Construction of a Portion of the Petersham-New Salem Highway in the County of Franklin	13,362.86	95,771.90
Installed Equipment	00.00	811.57
Temporary Equipment	00.00	149.50
Engineering Instruments	00.00	948.75
Automobile Purchase	00.00	535.00
Automobile Maintenance	113.55	6,123.34
Miscellaneous Expense (undistributed)	0.24	8,651.54
Printing and Blueprinting	3.60	690.48
Stationery and Office Supplies	00.00	159.13
Maintenance of Real Estate	00.00	551.60
Total Highway and Public Utility Relocation	$21,655.59	$1,365,635.27
QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, NURSERIES:		
Nurseries:		
Salaries, Engineering	$1,525.24	$3,323.39
Labor	11,335.97	30,549.59
Tools and Equipment	231.03	3,846.24
Automobile Purchase	—224.00	174.50
Automobile Maintenance	563.48	1,141.84
Nursery Stock	00.00	2,622.85
Nursery Supplies	908.32	2,758.44
Miscellaneous Expense	3.03	142.81
Medical and Surgical Services	31.00	31.00
Compensation to Labor for Injuries	27.86	27.86
Subtotal Reforestation, Nurseries	$14,401.93	$44,618.52
QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, WATERSHED PLANTING:		
Watershed Planting:		
Salaries, Engineering	$381.25	$1,284.51
Labor	4,737.25	17,253.35

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Tools and Equipment	78.00	262.81
Automobile Maintenance	27.52	193.69
Trees for Watershed Planting	00.00	1,713.00
Nursery Supplies	00.00	1,402.86
Miscellaneous Expense	00.00	63.85
Medical and Surgical Services	139.00	139.00
Compensation to Labor for Injuries	111.44	111.44
Sub Total Reforestation, Watershed Planting	$5,474.46	$22,424.51
QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, FIRE STOPS AND FIRE ACCESS ROADS:		
Salaries, Engineering	$1,400.75	$1,400.75
Legal and Expert Expense	81.24	81.24
Labor	22,344.01	22,344.01
Compensation to Labor for Injuries	807.94	807.94
Medical and Surgical Services	367.00	367.00
Contract No. 60, Access Road, Shaft 12	4,993.96	4,993.96
Automobile Purchase	500.00	500.00
Automobile Maintenance	610.00	610.00
Miscellaneous Expense (undistributed)	525.18	525.18
Printing and Blueprinting	12.21	12.21
Sub Total Reforestation, Fire Stops and Fire Access Roads	$31,642.29	$31,642.29
QUABBIN RESERVOIR WATERSHED PROTECTION—FENCING OF WATERSHED PROPERTY:		
Labor	$1,737.66	$1,737.66
Automobile Maintenance	74.82	74.82
Miscellaneous Expense	120.43	120.43
Sub Total, Fencing of Watershed Property	$1,932.91	$1,932.91
Total, Quabbin Reservoir Watershed Protection	$53,451.59	$100,618.23
Total, Quabbin Reservoir, not including Main Dam and Dike (except PWA)	$1,205,099.45	$15,983,818.68
TOTAL QUABBIN RESERVOIR, EXCEPT MAIN DAM AND DIKE	$1,216,879.32	$15,995,598.55

MAIN DAM

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$7,099.00	$46,606.48
Engineering, Headquarters' Office	23,415.11	163,946.66
Total General Overhead	$30,514.11	$210,553.14
ENGINEERING:		
Salaries, Engineering and Clerical	$57,503.55	$279,372.49
Legal and Expert Expense	31.14	35.20
Consultant Expense	122.17	5,840.71
Labor	16,070.15	42,299.64
Furniture and Fixtures	9.51	228.60
Laboratory Equipment	58.48	722.99
Rental of Equipment	00.00	1,202.25
Engineering Instruments	45.97	782.35

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Rent and Upkeep	200.57	1,516.01
Automobile Purchase	525.00	2,958.00
Automobile Maintenance	1,783.05	7,440.36
Contracts for Investigations and Surveys	00.00	61,895.52
Office Buildings	00.00	578.39
Special Experiments	00.00	1,853.29
Water Supply System	00.00	20.00
Compensation to Labor for Injuries	43.78	43.78
Medical and Surgical Services	64.50	68.50
Miscellaneous Expense (undistributed)	428.39	12,961.63
Printing and Blueprinting	284.19	2,078.49
Stationery and Office Supplies	152.41	1,429.27
Postage	37.75	171.33
Laboratory Supplies	32.45	228.09
Total Engineering	$77,393.06	$423,726.00
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 30, 32, 36 and 38	$00.00	$2,411,543.40
Contract No. 52, Constructing Embankment at Main Dam	$638,897.90	$1,461,489.80
Sub Total Construction Contracts	$638,897.90	$3,873,033.20
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$1,541.00	$6,125.25
Installed Equipment	16,685.42	20,277.47
Temporary Equipment	00.00	4,213.39
Miscellaneous Expense	82.15	12,701.70
Tools and Equipment	133.30	133.30
Sub Total Except Construction Contracts	$18,441.87	$43,451.11
Total Permanent Construction	$657,339.77	$3,916,484.31
TOTAL MAIN DAM	$765,246.94	$4,550,764.34

QUABBIN RESERVOIR BEAVER BROOK DIKE

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$468.12	$28,584.61
Engineering, Headquarters' Office	1,525.96	106,571.66
Total General Overhead	$1,994.08	$135,156.27
ENGINEERING:		
Salaries, Engineering and Clerical	$11,500.44	$175,082.63
Consultant Expense	157.67	5,662.78
Labor	4,009.61	33,828.25
Furniture and Fixtures	2.82	149.77
Laboratory Equipment	58.51	584.95
Rental and Equipment	00.00	921.50
Engineering Instruments	00.00	155.65
Rent and Upkeep	45.65	73.68
Automobile Purchase	00.00	600.00
Medical and Surgical Services	7.50	7.50
Automobile Maintenance	551.67	3,507.78
Contracts for Investigations and Surveys	00.00	24,773.32
Special Experiments	00.00	305.20
Miscellaneous Expense (undistributed)	147.94	5,046.94

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Printing and Blueprinting	13.17	1,348.63
Stationery and Office Supplies	20.91	206.91
Advertising	00.00	79.34
Postage	00.00	00.30
Laboratory Supplies	32.43	245.72
Maintenance of Grounds	81.47	81.47
Total Engineering	$16,629.79	$252,662.32
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 32 and 36	$00.00	$1,054,137.90
Contract No. 50, Constructing the Embankment of the Dike	$41,049.81	$1,401,751.98
Sub Total Construction Contracts	$41,049.81	$2,455,889.88
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$4,133.43	$15,142.48
Temporary Equipment	00.00	1,993.18
Tools and Equipment	133.30	148.00
Installed Equipment	00.00	235.00
Miscellaneous Expense	119.00	1,804.76
Sub Total Except Construction Contracts	$4,385.73	$19,323.42
Total Permanent Construction	$45,435.54	$2,475,213.30
TOTAL QUABBIN RESERVOIR BEAVER BROOK DIKE	$64,059.41	$2,863,031.89

SPECIAL INVESTIGATIONS

RELATIVE TO POLLUTION OF WARE AND QUINAPOXET WATERSHEDS:		
(Expenditures under Chapter 66, Resolves of 1931)	$00.00	$1,995.99
RELATIVE TO SETTING OFF A PORTION OF LAKE COCHITUATE FOR BOATING AND FISHING:		
(Expenditures under Chapter 18, Resolves of 1936)	$00.00	$12,512.58

RELATIVE TO IMPROVING DISTRIBUTION SYSTEM AND PREVENTING POLLUTION OF SOURCE OF SUPPLY OF METROPOLITAN WATER DISTRICT:

(Expenditures under Chapter 48, Resolves of 1936)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$355.91	$2,789.67
Engineering, Headquarters' Office	1,926.17	15,805.54
Total General Overhead	$2,282.08	$18,595.21
ENGINEERING:		
Salaries, Engineering and Clerical	$9,231.79	$50,867.24
Consultant Expense	983.40	983.40
Furniture and Fixtures	00.00	221.98
Engineering Instruments	00.00	1,120.12
Atlases	00.00	2,097.00
Automobile Purchase	00.00	1,492.50
Automobile Maintenance	399.87	2,154.33

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Contracts for Investigations and Surveys	6,150.65	54,123.95
Miscellaneous Expense (undistributed)	208.18	2,370.30
Printing and Blueprinting	544.06	775.20
Stationery and Office Supplies	25.23	226.37
Laboratory Supplies	00.00	23.46
Purchases and Settlements	50.00	50.00
Total Engineering	$17,593.18	$116,505.85
Total—Chapter 48 Investigation	$19,875.26	$135,101.06
TOTAL SPECIAL INVESTIGATIONS	$19,875.26	$149,609.63

SOUTHERN SUDBURY EMERGENCY SUPPLY

Total Expenditure	$00.00	$638,533.83

WACHUSETT WATERSHED—ELIMINATION OF POLLUTION

ENGINEERING:		
Salaries, Engineering and Clerical	$591.50	$591.50
Printing and Blueprinting	5.25	5.25
Stationery and Office Supplies	1.27	1.27
Rent and Upkeep	7.52	7.52
Automobile Maintenance	18.75	18.75
TOTAL WACHUSETT WATERSHED ELIMINATION OF POLLUTION	$624.29	$624.29

WESTON AQUEDUCT SIPHONS (PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$4.54	$4.54
Engineering, Headquarters' Office	2,585.39	2,585.39
Total General Overhead	$2,589.93	$2,589.93
ENGINEERING:		
Salaries, Engineering and Clerical	$905.82	$905.82
Consultant Expense	63.76	63.76
Furniture and Fixtures	45.00	45.00
Engineering Instruments	45.76	45.76
Miscellaneous Expense (undistributed)	87.08	87.08
Printing and Blueprinting	118.21	118.21
Stationery and Office Supplies	101.12	101.12
Advertising	207.75	207.75
Rent and Upkeep	18.56	18.56
Automobile Maintenance	4.70	4.70
Total Engineering	$1,597.76	$1,597.76
TOTAL WESTON AQUEDUCT SIPHONS	$4,187.69	$4,187.69

NEW PRESSURE AQUEDUCT AND HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)

SECTION WEST OF HIGH LEVEL DISTRIBUTING RESERVOIR IN WESTON (PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$23.26	$23.26
Engineering, Headquarters' Office	10,708.87	10,708.87
Total General Overhead	$10,732.13	$10,732.13

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
ENGINEERING:		
Salaries, Engineering and Clerical	$14,937.84	$14,937.84
Consultant Expense	512.61	512.61
Tools and Equipment	178.32	178.32
Furniture and Fixtures	344.40	344.40
Engineering Instruments	4,133.76	4,133.76
Purchase of Automobiles	8,735.37	8,735.37
Labor	578.62	578.62
Miscellaneous Expense (undistributed)	2,317.06	2,317.06
Printing and Blueprinting	100.07	100.07
Stationery and Office Supplies	236.78	236.78
Advertising	14.28	14.28
Postage	21.00	21.00
Medical and Surgical Supplies	2.94	2.94
Rent and Upkeep	314.35	314.35
Automobile Maintenance	474.59	474.59
Contracts for Investigations and Surveys	390.00	390.00
Total Engineering	$33,291.99	$33.291.99
REAL ESTATE:		
Salaries, Engineering and Clerical	$1,673.29	$1,673.29
Fire Protection, Equipment	34.69	34.69
Total Real Estate	$1,707.98	$1,707.98
Total, Section West of High Level Distributing Reservoir in Weston	$45,732.10	$45,732.10

HIGH LEVEL DISTRIBUTING RESERVOIR IN WESTON (PWA)

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	70.97	70.97
Total, High Level Distributing Reservoir in Weston	$70.97	$70.97

SECTION EAST OF HIGH LEVEL DISTRIBUTING RESERVOIR IN WESTON (PWA)

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	428.37	428.37
Total General Overhead	$428.37	$428.37
ENGINEERING:		
Salaries, Engineering and Clerical	$436.55	$436.55
Consultant Expense	47.15	47.15
Miscellaneous Expense (undistributed)	14.03	14.03
Printing and Blueprinting	1.05	1.05
Advertising	13.56	13.56
Total Engineering	$512.34	$512.34
REAL ESTATE:		
Salaries, Engineering and Clerical	$34.16	$34.16
Total Real Estate	$34.16	$34.16

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Total, Section East of High Level Reservoir in Weston	$974.87	$974.87
TOTAL NEW PRESSURE AQUEDUCT AND HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)	$46,777.94	$46,777.94

SUPERSTRUCTURE AT SHAFT NO. 4—SOUTHBOROUGH TUNNEL:

ENGINEERING:		
Salaries, Engineering and Clerical	$101.89	$101.89
TOTAL SUPERSTRUCTURE AT SHAFT NO. 4—SOUTHBOROUGH TUNNEL	$101.89.	$101.89

SUMMARY

CONSTRUCTION FUND

Total authorized under Chapters 111 and 375, Acts of 1926, and Chapter 321, Acts of 1927		$65,900,000.00	
Amount reverted from authorization under said Chapter 111		261,466.17	$65,638,533.83
Received from City of Worcester under said Chapter 321	$1,000,000.00		
Serial Bonds issued and matured	8,397,000.00		
Serial Bonds outstanding Nov. 30, 1938	38,853,000.00		
Balance of Authorization	17,388,533.83		
	$65,638,533.83		
Total Construction Fund (in Addition to Receipts Credited)			$65,638,533.83

EXPENDITURES

SOUTHERN SUDBURY EMERGENCY SUPPLY	$00.00	$638,533.83
WARE AND SWIFT SUPPLY		
Wachusett-Coldbrook Tunnel, Ware Supply	$102,567.00	$14,167,111.03
Wachusett Watershed Protection	12,084.93	18,823.22
Coldbrook-Swift Tunnel	44,177.46	5,387,972.98
Quabbin Reservoir Except Main Dam and Dike	1,216,879.32	15,995,598.55
Main Dam	765,246.94	4,550,764.34
Quabbin Reservoir Beaver Brook Dike	64,059.41	2,863.031.89
SPECIAL INVESTIGATIONS	19,875.26	149,609.63
PRESSURE AQUEDUCT, ETC.		
Wachusett Watershed, Elimination of Pollution	624.29	624.29
Weston Aqueduct Siphons, PWA	4,187.69	4,187.69

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
New Pressure Aqueduct and High Level Distributing Reservoir in Weston, PWA	46,777.94	46,777.94
Superstructure Shaft No. 4, Southborough Tunnel	101.89	101.89
Total Expenditures	$2,276,582.13	$43,823,137.28

RECEIPTS

Receipts from Sales	$47,438.47	$398,862.80
Receipts from Rents	15,886.96	452,924.40
All other Receipts	10,750.68	117,022.96
Total Receipts	$74,076.11	$968,810.16

DISTRIBUTION OF RECEIPTS

Credited as follows:			
To Assessments			
Rents and Sales, to 1928 Assessment . . .	$3,033.03		
Rents and Sales, to 1929 Assessment . . .	24,343.77		
Interest, to 1928-1934 Assessments . . .	282.11	$00.00	$27,658.91
To Construction Fund . .		74,076.11	941,151.25
		$74,076.11	$968,810.16

Financial Statement Verified.
Approved.

GEO. E. MURPHY,
Comptroller.

A tabulation of the acts and resolves under the authority of which expenditures are made by the Metropolitan District Water Supply Commission was included in the 1937 Annual Report.

Subsequent acts and resolves are as follows:

Chapter	*Brief Description*
240, Acts of 1938	Provisions for annexing Dana, Enfield, Greenwich and Prescott to contiguous towns.
460, Acts of 1938	Works to eliminate pollution. Completion of Weston Aqueduct Siphons. Portions of Pressure Aqueduct, etc.
501, Acts of 1938	Pressure Aqueduct to Chestnut Hill. Federal grant on works to eliminate pollution, on aqueducts and other distribution works and on portion of works to complete Ware-Swift project.

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

LOCATION OF REAL ESTATE ACQUIRED FOR THE QUABBIN RESERVOIR

(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL NOV. 30, 1937 AS PREVIOUSLY REPORTED (ACRES)	TOTAL NOV. 30, 1938. (ACRES)		REMARKS.
BARRE.	22		22	
BELCHERTOWN, within former limits.	3,063	3,091		*DANA, ENFIELD, GREENWICH AND PRESCOTT WERE DISCONTINUED, AND DIVIDED AMONG THE CONTIGUOUS TOWNS TO WHICH THEY WERE ANNEXED ON APRIL 28, 1938.
IN FORMER TOWN OF ENFIELD.		1,699	4,790	
*DANA.**	9,611			
*ENFIELD.**	8,826			
*GREENWICH.**	11,185			
HARDWICK, within former limits.	3,577	4,496		
IN FORMER TOWN OF GREENWICH.		607	5,103	
NEW SALEM, within former limits.	10,839	11,727		
IN FORMER TOWN OF ENFIELD.		3,500		
IN FORMER TOWN OF GREENWICH.		2,934		
IN FORMER TOWN OF PRESCOTT.		11,522	29,683	
ORANGE.	19		52	
PELHAM, within former limits.	4,961	5,543		
IN FORMER TOWN OF ENFIELD.		1,368	6,911	
PETERSHAM, within former limits.	1,712	1,921		
IN FORMER TOWN OF DANA.		12,049		
IN FORMER TOWN OF GREENWICH.		6,567		
IN FORMER TOWN OF PRESCOTT.		138	20,675	
*PRESCOTT.**	10,659			
SHUTESBURY.	4,063		4,492	
WARE, within former limits.	877	949		
IN FORMER TOWN OF ENFIELD.		4,600		
IN FORMER TOWN OF GREENWICH.		2,481	8,030	
WENDELL.	377		377	
TOTALS.	69,791.		80,135	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

TAKINGS OF REAL ESTATE AND WATER RIGHTS

TAKING FOR	TAK-ING NO.	TOWN	COUNTY	DATE OF TAKING	PLAN NO.	TITLE VESTED IN COMMONWEALTH FEE (Acres)	EASEMENT (Acres)
Southern Sudbury Emergency Supply.	1 to 9 incl.	Details previously reported in the 1930 Annual Report.			C-1 to C-15 incl.	258.81	29.02 (Also Water Rights)
Wachusett-Coldbrook Tunnel section of Quabbin Aqueduct.	1 to 4 incl.	Details previously reported in the 1930 Annual Report.			T-1 to T-13 incl.	570.22	20.37
Coldbrook-Swift Tunnel section of Quabbin Aqueduct.	1 to 3 incl.	Details previously reported in the 1931 Annual Report included 416.76 acres now reported under Quabbin Reservoir as part of S-29)			T-14 to T-27 incl.	128.05	4.06
Quabbin Reservoir.	1 to 20 incl. & 23 to 28 incl.	Details previously reported in the 1931, 1932, 1933, 1934, 1935, 1936 and 1937 Annual Reports.			S-1 to S-40 incl. and S-46 to S-55 incl.	1,812.04	20.09 (Also Water Rights)
" "	21	Shutesbury and Pelham.	Hampshire & Franklin	Jan. 13, 1938	S-41	105.60	
" "	22	Prescott and Pelham	Hampshire	Jan. 13, 1938	S-42 to S-45 incl.	439.73	
" " (General Taking)	29	Prescott, Enfield, Greenwich, Belchertown, Pelham, Ware, Hardwick, Dana, New Salem, Orange and Shutesbury.	Hampshire, Worcester & Franklin.	Mar. 28, 1938	S-56 to S-76 incl.	*14,886.11	
						*77,243.48	20.09
		*Includes 416.76 acres formerly reported under Quabbin Aqueduct and 1,657.34 acres previously taken for Quabbin Reservoir. =				-2,074.10	
		Includes 283.27 acres located beyond limits of general taking.				75,169.38	
Ware River Supply and Watershed.	1 to 2 incl.	Details previously reported in the 1931, 1932 and 1933 Annual Reports.			W-1 and A-1 to A-14 incl.	0.25	22.94 (Also Water Rights)

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1937 AND NOV. 30, 1938

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
47	*Service Building & Head House at Shaft 12 of Quabbin Aqueduct.*	*Greenwich***	*Swift*	*Vincent Caira*	*Apr. 17, 1936*	4	*April 21, 1936*	$ 34,990.00	$*35,744.73	*Jan. 4, 1938.*
50	*Dike Embankment-Quabbin Reservoir.*	*Enfield** & Ware*	*Swift*	*The Arthur A. Johnson Corporation*	*Nov. 13, 1934*	6	*Nov. 26, 1934*	1,446,655.00	ǂ1,402,751.98	*Nov. 9, 1938.*
53	*Head House at Shaft #9, Quabbin Aqueduct*	*Barre*	*Swift*	*The English Construction Co.*	*Apr. 24, 1936*	2	*Apr. 30, 1936*	9,300.00	9,785.63	*June 9, 1938.*
57	*Portion of Petersham-New Salem Highway.*	*New Salem*	*Swift*	*John Iafolla Constr. Co.*	*July 2, 1936*	6	*July 2, 1936*	161,109.50	▲ 168,822.96	*Nov. 24, 1937.*
58	*Making Core Borings (A contract by the Joint Board under Chapter 48, Resolves of 1936, i.e., House Bill 262, 1938)*	*Counties of Middlesex, Norfolk, Suffolk and Worcester.*	*Special Investigation.*	*Pennsylvania Drilling Company.*	*Mar. 18, 1937*	6	*Mar. 23, 1937*	52,950.00	50,944.65	*Dec. 18, 1937.*

(The above contracts were all awarded to the lowest bidder.)

* *$500.00 of this total withheld pending expiration of guarantee period.*
ǂ *1,000.00 of this total withheld as a guarantee of removal of Contractor's equipment.*
▲ *Of this amount the State Dept. of Public Works has paid $73,051.06 covering the surfacing, and guard rail items.*
** *Annexed to adjoining towns since contract was awarded.*

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1938

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
33	Purchase of Power at Shaft 1.	West Boylston	Ware	New England Power Co.	Date of Agreement = Aug. 6, 1931			Agreed Rates	$ 4,036.63
42	Use of Worcester Sewerage System and Treatment Works a/c Rutland-Holden Sewer.	Worcester	Ware	City of Worcester	Date of Agreement = May 1, 1933.			Lump Sum = $ 325,000.00 Annual Charges = ✳	325,000.00 1,177.56
46	Connection with Rutland-Holden Sewer, & Disposal of Sewage from the U.S. Veterans Hospital.	Rutland (Note:- Payments under Contract 46 are RECEIVED by the M.D.W.S.C.)	Ware	U.S. Veterans Administration	Date of Agreement = Nov. 7, 1934.			Lump Sum = 37,000.00 Annual Charges = ✳	37,000.00 1,312.21
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium.	Rutland (Note:- Payments under Contract 48 are RECEIVED by the M.D.W.S.C.)	Ware	Rutland State Sanatorium.	Date of Agreement = June 5, 1934.			Lump Sum = 60,000.00 Contingent Charges = ✳	60,000.00 None
49	Excavating Diversion Channels at the Site of Quabbin Reservoir.	Dana**, Hardwick & Greenwich**	Swift	Cenedella & Co.	Sept. 10, 1935	12	Oct. 1, 1935	79,050.00	★ 84,789.69
52	Main Dam Embankment - Quabbin Reservoir.	Belchertown, Enfield** & Ware.	Swift	Benjamin Foster Company	July 2, 1936	9	July 16, 1936	2,317,445.00	1,461,489.80
56	Constructing Administration Bldgs., Main Dam.	Belchertown	Swift	Rich Bros. Construction Co., Inc.	June 10, 1937	14	June 24, 1937	362,445.00	356,445.95
60	Constructing Access Roads - Shaft 12.	Hardwick & Greenwich**	Swift	Middlesex Construction Company	Dec. 2, 1937	22	Dec. 16, 1937	78,348.00	63,479.81
61	Clearing portion of Site of Quabbin Reservoir on West Branch of Swift River.	Belchertown, Shutesbury, Pelham, New Salem & Ware.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	5	Oct. 20, 1938	268,700.00	• None
62	Clearing portion of Site of Quabbin Reservoir on Lower Middle and East Branches of Swift River.	Ware, New Salem, Petersham and Hardwick.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	5	Oct. 20, 1938	344,100.00	• None
63	Clearing portion of Site of Quabbin Reservoir on Central portion of Middle Branch of Swift River.	New Salem, Petersham and Hardwick.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	6	Oct. 20, 1938	217,500.00	• None
64	Constructing Service Bldgs., Shafts 1 and 8	West Boylston and Barre	Ware	Platt Contracting Co., Inc.	Aug. 25, 1938	6	Oct. 25, 1938	82,000.00	• None
65	Install Shaft Caps & Aqueduct Control Valves at Shaft 1.	West Boylston	Ware	Engineering Service & Construction Co.	Sept. 8, 1938	5	Sept. 22, 1938	11,335.00	None
66	Regulating Dams on Middle & East Branches of Swift River.	New Salem, Hardwick & Petersham	Swift	C. & R. Construction Co.	Aug. 25, 1938	11	Oct. 20, 1938	171,650.00	• None
72	Clearing portion of Site of Quabbin Reservoir on Upper Middle and East Branches of Swift River.	New Salem, Hardwick & Petersham	Swift	C. & R. Construction Co.	Oct. 3, 1938	4	Oct. 20, 1938	469,975.00	• None
73	Inverted Pipe Siphons on Weston Aqueduct.	Framingham & Wayland	Wachusett	Leo Butler Company	Nov. 2, 1938	8	Nov. 9, 1938	265,832.50	■ None
76	Making Core Borings, along proposed pressure aqueduct locations.	Counties of Middlesex, Norfolk, Suffolk & Worcester.	Wachusett	Sprague & Henwood Inc.	Oct. 10, 1938	4	Oct. 20, 1938	11,885.00	• None
88	Storing Topsoil at Dike and Quabbin Park Cemetery.	Ware	Swift	Warner Bros., & Goodwin, Inc.	Nov. 3, 1938	5	Nov. 3, 1938	7,620.00	None

(The above contracts were all awarded to the lowest bidder.)

✳ Proportion of Annual Maintenance Cost.
★ Work accepted, final settlement pending.
• Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1551-F, Mass. State Project No. D-208.
■ " " " " " " " " " " " " 1520-F, " " " " " -202.
** Annexed to adjoining towns since contract was awarded.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 61

FOR CLEARING A PORTION OF QUABBIN RESERVOIR ON THE WEST BRANCH OF THE SWIFT RIVER.
P.W.A. DOCKET NO. MASS. 1551-F
MASS. STATE PROJECT NO. D-208
ITEM E — SECTION 1

CANVASS OF BIDS FOR CONTRACT 61 — OPENED OCT. 3, 1938.

				★ ① Coleman Bros., Corp 245 State St, Boston, Mass.		② C&R Construction Co. 75 Bradeen St. Roslindale Mass.		③ Schutt Construction Company Genoa, Wisconsin		④ S.J. Groves and Sons Co., Municipal Bldg. Ridgefield, N.J.		⑤ Webster Lumber Company 2522 Como Ave., West, St. Paul, Minn.	
ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing Section A	Lump Sum			$ 31,000.		$ 35,840.		$ 57,600.		$ 57,600		$ 60,800.
2	Clearing Section B	Lump Sum			40,000		46,200.		74,250.		94,875.		98,875.
3	Clearing Section C	Lump Sum			31,500		36,680.		55,775.		75,325.		78,575
4	Clearing Section D	Lump Sum			53,000.		61,880.		99,450		110,500.		116,025.
5	Clearing Section E	Lump Sum			64,000		73,640.		85,475.		46,025.		53,600.
6	Clearing Section F	Lump Sum			29,000		34,440.		39,975.		36,900.		39,975
7	Removing Excrementitious Material	Cubic Yard	400	3.	1,200	7.	2,800.	6.	2,400.	5.	2,000.	5.25	2,100.
8	Grubbing	Acre	100	100.	10,000	120.	12,000.	140	14,000.	140.	14,000.	150.	15,000.
9	Earth Excavation	Cubic Yard	15,000	.50	7,500.	60	9,000.	90	13,500.	.95	14,250.	1.10	16,500.
10	Rock Excavation	Cubic Yard	500	3.	1,500.	1.	500.	2 50	1,250.	3.	1,500.	2.75	1,375
			Totals		$ 268,700.00		$ 312,980.00		$ 443,675.00		$ 452,975.00		$ 482,825.00
	Bid Bond Deposit				$ 14,750.00		$ 14,750.00		$ 14,750.00		$ 14,750.00		$ 14,750.00

★ Contract awarded 10-20-38
Contract executed 10-20-38

CONTRACT 62

FOR CLEARING A PORTION OF QUABBIN RESERVOIR ON THE LOWER MIDDLE AND EAST BRANCHES OF THE SWIFT RIVER
P.W.A. DOCKET NO. MASS 1551-F
MASS STATE PROJECT NO. D-208
ITEM E — SECTION 2

CANVASS OF BIDS FOR CONTRACT 62 — OPENED OCT. 3, 1938.

				★ ① Coleman Bros., Corp 245 State St, Boston, Mass		② C & R. Construction Co 75 Bradeen St., Roslindale, Mass.		③ Webster Lumber Company 2522 Como Ave, West, St. Paul, Minn		④ S.J Groves and Sons Co., Municipal Bldg Ridgefield, N J.		⑤ Schutt Construction Company Genoa Wisconsin	
ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing Section G	Lump Sum			$ 51,500.		$ 53,500		$ 77,036.		$ 107,000.		$ 96,300.
2	Clearing Section H	Lump Sum			64,000.		70,500		75,411.		84,600.		105,750.
3	Clearing Section I	Lump Sum			38,000.		39,250.		44.052		47,100.		47,100.
4	Clearing Section J	Lump Sum			33,000.		34,750.		37,837.		41,700.		48,650.
5	Clearing Section K	Lump Sum			74,000.		77,000.		82,706.		92,400.		130,700.
6	Clearing Section L	Lump Sum			50,000.		47,250.		69,389.		94,500.		70,875.
7	Removing Excrementitious Material	Cubic Yard	700	3.	2,100.	7.	4,900.	5.25	3,675.	5.	3.500.	6	4,200.
8	Grubbing	Acre	200	100.	20,000.	120.	24,000.	150.	30,000.	140.	28,000.	140.	28,000.
9	Earth Excavation	Cubic Yard	20.000	50	10,000.	.60	12,000.	1 10	22,000.	.95	19,000.	.90	18.000.
10	Rock Excavation	Cubic Yard	500	3.	1,500.	1.	500	2 75	1,375.	3.	1,500.	2.50	1,250.
			Totals		$ 344.100.00		$ 363.650.00		$ 443,481.00		$ 519,300.00		$ 550,825.00
	Bid Bond Deposit				$ 19,250.00		$ 19,250.00		$ 19,250.00		$ 19,250.00		$ 19,250.00

★ Contract awarded 10-20-38
Contract executed 10-20-38

I certify the foregoing to be a true and accurate summary of all bids on the above contracts Nos. 61 and 62 received this day by the METR DISTR. WATER SUPPLY COMM.

R. Nelson Molt
R. Nelson Molt
Secretary

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 63

FOR CLEARING A PORTION OF QUABBIN RESERVOIR ON THE CENTRAL PORTION OF THE MIDDLE BRANCH OF THE SWIFT RIVER
P.W.A. DOCKET NO. MASS. 1551-F – MASS. STATE PROJECT NO. D-208
ITEM E – SECTION 3.

CANVASS OF BIDS FOR CONTRACT 63 — OPENED OCT. 3, 1938.

				★ ① COLEMAN BROS., CORP. 245 STATE ST., BOSTON, MASS.		② C.&R. CONSTRUCTION COMPANY. 75 BRADEEN ST., ROSLINDALE, MASS		③ NEVADA CONST., CO NEVADA, MISSOURI		④ WEBSTER LUMBER CO. 2522 COMO AVE., WEST ST. PAUL, MINNESOTA		⑤ SCHUTT CONST., CO GENOA, WISCONSIN		⑥ S.J. GROVES & SONS CO. MUNICIPAL BLDG., RIDGEFIELD, N. J	
ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing Section M	Lump Sum			$ 54,000.		$ 56,000.		$ 67,200.		$ 95,300.		$ 78,400.		$ 100,800.
2	Clearing Section N	Lump Sum			33,000.		33,500.		52,930.		43,600.		53,600.		46,900.
3	Clearing Section O	Lump Sum			18,000.		18,750.		30,000.		16,900.		30,000.		18,750.
4	Clearing Section P	Lump Sum			50,000.		50,250.		76,380.		80,425.		90,450.		85,425.
5	Clearing Section Q	Lump Sum			34,000.		35,250.		42,300.		45,850.		52,875.		49,350.
6	Clearing Section R	Lump Sum			13,000.		12,250.		19,600.		23,500.		20,875.		24,500.
7	Removing Excrementitious Material	Cubic Yard	500	3.	1,500.	7.	3,500.	4.25	2,125.	5.25	2,625.	6.	3,000.	5.	2,500.
8	Grubbing	Acre	50	100.	5,000.	120.	6,000.	115.	5,750.	150.	7,500.	140.	7,000.	140.	7,000.
9	Earth Excavation	Cubic Yard	15,000	.50	7,500.	.60	9,000.	1.	15,000.	1.10	16,500.	.90	13,500.	.95	14,250.
10	Rock Excavation	Cubic Yard	500	3.	1,500.	1.	500.	2.85	1,425.	2.75	1,375.	2.50	1,250.	3.	1,500.
			Totals		$ 217,500.00		$ 225,000.00		$ 312,710.00		$ 333,575.00		$ 350,950.00		$ 350,975.00
	Bid Bond Deposit				$ 12,000.		$ 12,000.		$ 12,000.		$ 12,000.		$ 12,000.		$ 12,000.

★ Contract awarded 10-20-38.
Contract executed 10-20-38.

CONTRACT 72

FOR CLEARING A PORTION OF QUABBIN RESERVOIR ON THE UPPER MIDDLE AND EAST BRANCHES OF THE SWIFT RIVER
P.W.A. DOCKET NO. MASS. 1551-F
MASS. STATE PROJECT NO. D-208
ITEM E – SECTION 4.

CANVASS OF BIDS FOR CONTRACT 72 — OPENED OCT. 3, 1938.

				★ ① C.&R. CONSTRUCTION COMPANY 75 BRADEEN ST., ROSLINDALE, MASS.		② COLEMAN BROS. CORP. 245 STATE ST., BOSTON, MASS.		③ S. J. GROVES & SONS, CO. MUNICIPAL BLDG., RIDGEFIELD, N. J.		④ WEBSTER LUMBER CO., 2522 COMO AVE., WEST ST PAUL, MINNESOTA	
ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing Section S	Lump Sum			$ 65,725.		$ 73,000.		$ 119,500.		$ 125,475.
2	Clearing Section T	Lump Sum			53,075.		60,000.		86,850.		101,325.
3	Clearing Section U	Lump Sum			69,850.		77,000.		114,300.		133,350.
4	Clearing Section V	Lump Sum			79,750.		88,000.		145,000.		152,200.
5	Clearing Section W	Lump Sum			94,050.		105,000.		188,100.		188,100.
6	Clearing Section X	Lump Sum			85,525.		80,000.		155,500.		171,050.
7	Removing Excrementitious Material	Cubic Yard	500	7.	3,500.	3.	1,500.	5.	2,500.	5.25	2,625.
8	Grubbing	Acre	50	120.	6,000.	100.	5,000	140.	7,000.	150.	7,500.
9	Earth Excavation	Cubic Yard	20,000	.60	12,000.	.50	10,000.	95	19,000.	1.10	22,000.
10	Rock Excavation	Cubic Yard	500	1.	500	3.	1,500.	3.	1,500.	2.75	1,375.
			Totals		$ 469,975.00		$ 501,000.00		$ 839,250.00		$ 905,000.00
	Bid Bond Deposit				$ 23,600.		$ 23,600.		$ 23,600.		$ 23,600.

★ Contract awarded 10-20-38.
Contract executed 10-25-38.

I certify the foregoing to be a true and accurate summary of all bids on the above contracts Nos. 63 and 72 received this day by the Met. Dist. Water Supply Comm.

R. Nelson Molt
R. Nelson Molt
Secretary

CANVASS OF BIDS FOR CONTRACT 66 OPENED AUGUST 25, 1938.

Item	Description	Quantity	Unit	* ① C&R. Construction Co 75 Bradeen Street Roslindale, Mass Price	Amount	② National Engineering & Contracting Co 66 Park St Dorchester, Mass. Price	Amount	③ Frank T Westcott 95 High Street North Attleboro, Mass Price	Amount	④ M DeMatteo Construction Co 55 Stella Road Roslindale, Mass Price	Amount
1	Clearing	725	Acre	$ 90.	$ 65,250.	$ 50.	$ 36,250	$ 100.	$ 72,500	$ 85.	$ 61,625
2	Grubbing	30	Acre	90	2,700.	300.	9,000	160.	4,800	100	3,000.
3	Earth Excavation	40,000	Cu Yd	040	16,000.	44	17,600	40	16,000	32	12,800
4	Rock Excavation	1,000	Cu Yd	2	2.000	3.	3,000	2.	2,000	3.25	3,250.
5	Consolidated Pervious Embankment	20,000	Cu Yd	25	5,000	50	10,000	20	4,000	.48	9,600
6	Rolled Impervious Embankment	7,500	Cu Yd	1.	7,500	50	3,750	1.	7,500.	1.05	7,875.
7	Miscellaneous Embankment	3,000	Cu Yd	30	900.	44	1,320	.20	600.	04	1,200.
8	Selected Coarse Material	3,500	Cu Yd	60	2,100	50	1,750.	50	1,750.	.60	2,100.
9	Crushed Stone or Screened Gravel	2,700	Cu Yd.	2.50	6,750.	325	8,775	1.50	4,050	2.05	5,535
10	Riprap	5,000	Cu Yd	1.50	7,500	3.25	16,250	1 50	7,500	2.60	13,000.
11	Paving	500	Cu Yd	5.	2,500	10.	5,000.	5.	2,500.	4.50	2,250
12	Soil Dressing	800	Cu Yd	1.	800.	1.	800	1.50	1,200.	1.50	1,200.
13	Seeding and Grassing	1	Acre	300.	300.	200.	200	200	200.	600.	600
14	Gravel Road Surfacing	5,000	Cu Yd	.40	2.000	.60	3,000.	.65	3,250.	.85	4,250.
15	Portland Cement	5,000	Bbl.	2 70	13,500	2 60	13,000	3	15,000.	3.16	15,800.
16	Concrete, Class A	1,100	Cu Yd	7 50	8,250.	10	11,000	10.	11,000.	8 00	8,800
17	Concrete, Class B	1,100	Cu Yd.	8.	8,800.	15.	16,500	15.	16,500.	9 75	10,725.
18	Concrete, Class C	800	Cu.Yd.	12 50	10,000.	21.	16,800.	18	14,400.	16.50	13,200
19	Reinforcing Steel	70,000	Lb	035	2,450.	06	4,200	05	3,500.	.057	3,990
20	Miscellaneous Steel and Iron	50,000	Lb	07	3,500.	.07	3,500	08	4,000.	.19	9,500
21	Galvanizing	15,000	Lb.	.05	750.	.06	900.	.02	300.	11	1,650.
22	Miscellaneous Lumber	1	M.B.M.	100.	100.	300.	300.	60.	60.	100	100.
23	Stream Control, Middle Branch	Lump	Sum	1,000	1,000.	500.	500	1,500	1,500.	3,000	3,000.
24	Stream Control, East Branch	Lump	Sum	1,500.	1,500.	5,000.	5,000.	2,000	2,000.	3,000.	3,000.
25	Cleaning Up	Lump	Sum	500.	500	500.	500	500.	500.	3,000.	3,000
			Totals		$ 171,650.		$ 188,895		$ 196,610.		$ 201,050.

Item	Description	Quantity	Unit	⑤ Carlo Bianchi & Company, Inc. 24 Union Ave, Framingham Mass Price	Amount	⑥ B. A Gardetto, Inc. 79 Milk St Boston, Mass. Price	Amount	⑦ Kuchar Bros Montvale, N J. Price	Amount	⑧ J.F. Fitzgerald Constr. Co. 214 Essex St Boston, Mass Price	Amount
1	Clearing	725	Acre	$ 125	$ 90,625.	$ 150.	$ 108,750.	$ 110	$ 79,750	$ 147.50	$ 106,937 50
2	Grubbing	30	Acre	150.	4,500.	240.	7,200.	300.	9,000.	225.	6,750
3	Earth Excavation	40,000	Cu Yd	25	10,000.	.30	12,000	.50	20,000	.33	13,200.
4	Rock Excavation	1,000	Cu Yd	2.	2,000.	.30	300	7	7,000	3.	3,000
5	Consolidated Pervious Embankment	20,000	Cu Yd	.25	5,000	.17	3.400	30	6,000	.44	8,800
6	Rolled Impervious Embankment	7,500	Cu Yd	.75	5,625	50	3,750	80	6,000.	.44	3,300.
7	Miscellaneous Embankment	3,000	Cu Yd	25	750.	.45	1,350.	.20	600	.44	1,320.
8	Selected Coarse Material	3,500	Cu Yd	.25	875	.50	1,750	1	3,500.	.45	1,575
9	Crushed Stone or Screened Gravel	2,700	Cu Yd.	1 50	4,050	1.50	4,050	2.	5,400.	2.40	6.480
10	Riprap	5,000	Cu Yd	2.50	12,500	2 50	12.500	3	15,000	2.00	10,000.
11	Paving	500	Cu Yd	3	1,500	4.	2,000	10	5,000	3.50	1,750
12	Soil Dressing	800	Cu Yd	1.	800.	1.	800	2	1,600	1.10	880
13	Seeding and Grassing	1	Acre	250	250.	250.	250.	300	300	75.	75
14	Gravel Road Surfacing	5,000	Cu Yd	35	1,750.	.40	2,000.	.90	4,500.	.45	2.250
15	Portland Cement	5,000	Bbl.	2 75	13,750.	3	15,000.	3.	15,000	2.65	13,250.
16	Concrete, Class A	1,100	Cu Yd	13	14,300.	9.	9,900.	10.	11,000.	8.20	9,020.
17	Concrete, Class B	1,100	Cu Yd.	13.	14,300.	11	12,100.	13.	14,300	16.20	17,820
18	Concrete, Class C	800	Cu.Yd.	14.	11,200.	23.	18,400	16.	12,800.	14.96	11,968
19	Reinforcing Steel	70,000	Lb	.05	3,500.	.05	3,500	.06	4,200	.06	4,200
20	Miscellaneous Steel and Iron	50,000	Lb	.10	5,000.	.10	5,000.	.14	7,000.	.09	4,500
21	Galvanizing	15,000	Lb.	05	750.	.10	1,500	.04	600.	.02	300
22	Miscellaneous Lumber	1	M.B.M.	100	100.	100.	100.	100.	100	60.	60
23	Stream Control, Middle Branch	Lump	Sum	200.	200	400	400.	1,500.	1,500.	5,000.	5,000.
24	Stream Control, East Branch	Lump	Sum	500.	500.	700	700.	3,000.	3,000.	7,620	7,620
25	Cleaning Up	Lump	Sum	200.	200.	300.	300.	600.	600.	750.	750
			Totals		$ 204,025.		$ 227,000		$ 233,750		$ 240,805 50

Item	Description	Quantity	Unit	⑨ V Barletta Co. 10 Whipple Avenue Roslindale, Massachusetts Price	Amount	⑩ The Two Companies, Inc. Boston, Mass Price	Amount	⑪ Benjamin Foster Co. 20th & Erie Ave. Phila., Pa. Price	Amount
1	Clearing	725	Acre	$ 95.	$ 68,875	$ 170.	$ 123,250.	$ 150.	$ 108,750.
2	Grubbing	30	Acre	400.	12,000	300.	9,000.	200.	6,000.
3	Earth Excavation	40,000	Cu Yd	60	24,000	45	18,000.	.50	20,000
4	Rock Excavation	1,000	Cu Yd	4	4,000	4	4,000.	1.50	1,500.
5	Consolidated Pervious Embankment	20,000	Cu Yd	.40	8,000	45	9,000	.45	9,000
6	Rolled Impervious Embankment	7,500	Cu Yd	.90	6,750.	75	5,625	60	4,500.
7	Miscellaneous Embankment	3,000	Cu Yd	60	1,800.	45	1,350	.60	1,800.
8	Selected Coarse Material	3,500	Cu Yd	1	3.500.	45	1,575	.60	2,100.
9	Crushed Stone or Screened Gravel	2,700	Cu Yd.	3.50	9,450	1 50	4,050.	4.50	12,150
10	Riprap	5,000	Cu Yd	3.50	17,500.	3	15,000	2.75	13,750
11	Paving	500	Cu Yd	5.00	2.500	6	3,000	5.	2,500
12	Soil Dressing	800	Cu Yd	1 50	1.200.	1.50	1,200.	1.	800
13	Seeding and Grassing	1	Acre	400	400	200	200	200.	200.
14	Gravel Road Surfacing	5,000	Cu Yd	1.20	6,000	1.	5,000.	.50	2.500.
15	Portland Cement	5,000	Bbl.	3	15,000.	3.	15,000.	3.70	18,500.
16	Concrete, Class A	1,100	Cu Yd	8	8,800	18.	19,800.	15.	16,500
17	Concrete, Class B	1,100	Cu Yd.	11.	12.100.	18.	19,800.	20.	22,000.
18	Concrete, Class C	800	Cu.Yd.	15.	12,000.	18.	14,400	22.	17,600.
19	Reinforcing Steel	70,000	Lb	05	3,500.	06	4,200.	.06	4,200.
20	Miscellaneous Steel and Iron	50,000	Lb	.09	4,500.	.15	7,500.	.12	6,000
21	Galvanizing	15,000	Lb.	.20	3,000	.06	900	.05	750
22	Miscellaneous Lumber	1	M.B.M.	150.	150	150	150	150.	150
23	Stream Control, Middle Branch	Lump	Sum	20,000.	20,000	1,500.	1,500	12,000.	12,000
24	Stream Control, East Branch	Lump	Sum	10,000.	10,000.	2,000	2,000.	10,000.	10,000
25	Cleaning Up	Lump	Sum	3,500	3.500.	1,000	1,000.	1,000.	1,000.
			Totals		$ 258,525.		$ 286,500.		$ 294,250.

* Contract Awarded Oct 20, 1938
Contract Executed Oct 25, 1938

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No 66 received this day by the METR DISTR. WATER SUPPLY COMM.

R Nelson Molt
R. NELSON MOLT
Secretary

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.
CONTRACT 66
FOR
CONSTRUCTING REGULATING DAMS ON THE MIDDLE BRANCH OF THE SWIFT RIVER IN THE TOWN OF NEW SALEM AND ON THE EAST BRANCH OF THE SWIFT RIVER IN THE TOWN OF HARDWICK AND IN THE FORMER TOWN OF DANA (NOW PETERSHAM) MASSACHUSETTS

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 73

FOR CONSTRUCTING INVERTED PIPE SIPHONS ON THE WESTON AQUEDUCT AT SUDBURY RIVER AND HAPPY HOLLOW IN THE TOWNS OF FRAMINGHAM AND WAYLAND, MASSACHUSETTS

P.W.A. DOCKET NO. MASS. 1520-F
MASS STATE PROJECT NO. D-202

CANVASS OF BIDS FOR CONTRACT 73 — OPENED NOVEMBER 2, 1938.

ITEM	DESCRIPTION	UNIT	QUANTITY TYPE A	QUANTITY TYPE B	★ ① Leo Butler Company, Katonah, New York TYPE A.		② Coleman Bros Corp. 245 State Street, Boston, Mass TYPE A		③ Coleman Bros Corp. 245 State Street, Boston, Mass TYPE B		④ Tuller Construction Co, 95 Monmouth St. Red Bank, N J TYPE B	
					PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing	Acre	2	2	$175.-	$ 350	$150 –	$ 300.	$150 -	$ 300.	$300.-	$ 600
2	Earth Excavation	Cubic Yard	40,000	36.600	35	14.000	1 –	40,000.	1.-	36.600	.30	10,980
3	Rock Excavation	Cubic Yard	50	50	3.50	175	5 –	250.	5.-	250	10.-	500
4	Refill and Embankment (except Item 5)	Cubic Yard	27,000	25,500	20	5,400	30	8,100	.30	7.650.	.25	6,375
5	Compacted Refill and Embankment	Cubic Yard	6.500	6.500	.90	5,850	50	3,250.	.50	3,250	1.25	8.125
6	Soil Dressing and Grassing	Cubic Yard	4.000	4,000	1.00	4,000	1 50	6,000	1.50	6,000	1.-	4,000
7	Crushed Stone and Screened Gravel	Cubic Yard	200	270	2.25	450	3 50	700	3.50	945	3 -	810
8	Paving	Cubic Yard	100	100	4 50	450	4.–	400.	4 –	400.	7 -	700
9	Pipe Siphon	Linear Foot	4,785	4.785	44.50	212,932.50	45 -	215,325.	46.-	220,110	55.60	266.046
10	Concrete Envelope	Cubic Yard	1,000	1,600	7 00	7,000	10.–	10,000	10.–	16,000.	8 ~	12 800
11	Concrete (except Items 9 and 10)	Cubic Yard	50	50	14 00	700	15 -	750.	15.-	750	15 -	750
12	Reinforcing Steel	Pound	7,000	7.000	.045	315	.05	350	.05	200.	04	160
13	Portland Cement	Barrel	1,700	2,700	2.70	4,590	3 -	5,100	3.-	8,100	2 50	6,750
14	Miscellaneous Steel and Iron	Pound	25,000	25,000	09	2,250	10	2,500	.10	2,500	.08	2.000
15	Galvanizing	Pound	6,000	6,000	04	240	05	300	05	300.	.01	60
16	Caring for and Setting Metal Work furnished [by the Commission	Pound	6.000	6,000	04	240	05	300	.05	300.	08	480
17	Road Surfacing	Square Yard	2,000	2,000	1 20	2,400	1 25	2,500	1.25	2,500	1 -	2.000
18	Wooden Sheeting ordered left in place	M feet, B.M.	15	15	45 00	675	60 -	900	60 –	900	50 -	750
19	Tile Pipe 8" or less in diameter	Linear Foot	200	200	60	120	1 -	200	1.-	200	50	100
20	Tile Pipe 9" to 18" diameter	Linear Foot	50	50	1 40	70	2 -	100	2.–	100	75	37 50
21	Sudbury River Crossing	Lump Sum				2,425.		2,000		2,000		10.000
22	Cleaning up	Lump Sum				1,200		500		500		2,500
	TOTALS					$265,832.50		$299,825.00		$309,855 00		$336,523 50
	Bid Bond Deposit				Certified Check	$17,500		$17,500		$17,500.		$17,500

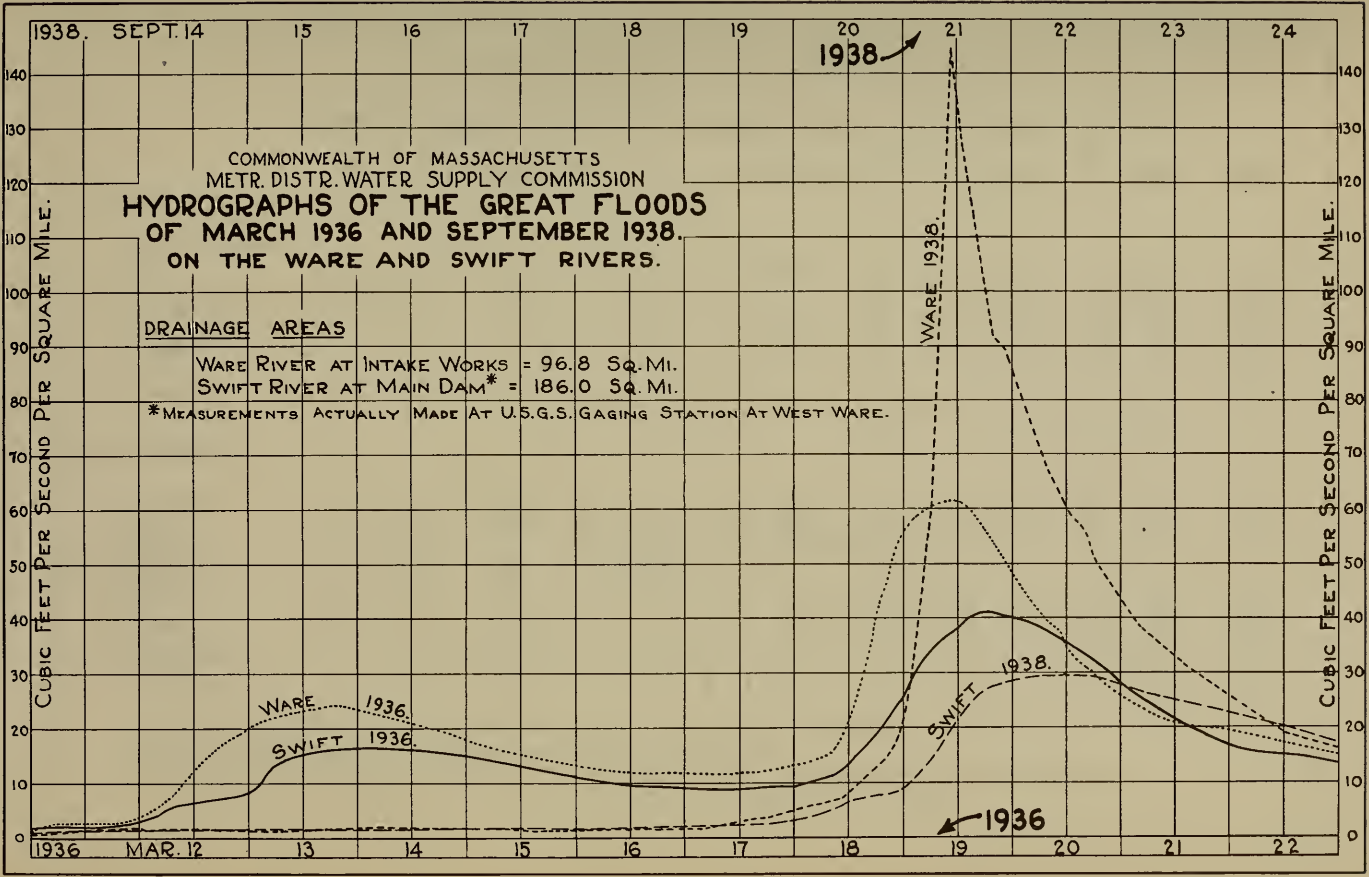
ITEM	DESCRIPTION	⑤ John MacDonald Const Co 215 California Street, Newton, Mass TYPE B		⑥ V. Barletta Company, 10 Whipple Ave Roslindale, Mass TYPE B		⑦ V Barletta Company, 10 Whipple Ave. Roslindale, Mass TYPE A		⑧ Spencer White & Prentis, Inc 10 East Fortieth St, New York, N Y TYPE A	
		PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Clearing	$2,000 -	$ 4,000.	$1,000 -	$ 2.000	$1,000.-	$ 2,000	$175.-	$ 350
2	Earth Excavation	2 -	73,200	2 -	73 200	2 -	80,000	35	14,000
3	Rock Excavation	14 -	700	2 -	100	2 -	100	18 -	900
4	Refill and Embankment (except Item 5)	.50	12,750.	50	12,750	50	13,500	50	13,500
5	Compacted Refill and Embankment	1 -	6,500	1 -	6,500	1 –	6,500	1.25	8,125
6	Soil Dressing and Grassing	2 -	8,000	1 -	4,000	1 –	4,000	1 70	6.800
7	Crushed Stone and Screened Gravel	4 -	1,080.	4 -	1,080	4 -	800	5.-	1,000
8	Paving	4 -	400.	6 -	600	6	600	4 -	400
9	Pipe Siphon	37 -	177,045	40 -	191,400	45.-	215,325	72 50	346,912 50
10	Concrete Envelope	10 -	16,000	10 -	16.000	10	10,000	15 -	15,000
11	Concrete (except Items 9 and 10)	14 -	700	12 -	600	12 -	600	32 -	1.600
12	Reinforcing Steel	06	240.	06	240	.06	420	.08	560
13	Portland Cement	3 -	8,100.	2 75	7,425	2.75	4,675	4.20	7,140
14	Miscellaneous Steel and Iron	08	2,000.	.10	2,500	.10	2 500	14	3,500.
15	Galvanizing	10	600	10	600	.10	600.	07	420
16	Caring for and Setting Metal Work furnished [by the Commission	04	240	10	600.	10	600	05	300
17	Road Surfacing	1 -	2,000.	1.–	2,000.	1 –	2,000	1.70	3,400
18	Wooden Sheeting ordered left in place	60.-	900.	100.–	1,500.	100 –	1,500	60.-	900
19	Tile Pipe 8" or less in diameter	2 -	400	2 -	400	2 –	400	2.-	400
20	Tile Pipe 9" to 18" diameter	4 -	200.	3 -	150.	3 -	150	3 -	150
21	Sudbury River Crossing		20,000.		10,000.		10,000		11,000
22	Cleaning up		2,000.		5,000		5,000		4,000
	TOTALS		$337,055 00		$338,645.00		$361,270.00		$440,357 50
	Bid Bond Deposit		$17,500	Certified Check	$17,500.	Certified Check	$17,500		$17,500.

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No 73 received this day by the Metr Distr Water Supply Comm

R Nelson Molt
R Nelson Molt, Secretary

★ Contract awarded Nov. 9, 1938.
Contract executed Nov. 17, 1938

Type A = Reinforced Steel Cylinder Precast Pipe
Type B = Steel Plate Pipe Mortar Lined


COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
HYDROGRAPHS OF THE GREAT FLOODS OF MARCH 1936 AND SEPTEMBER 1938.
ON THE WARE AND SWIFT RIVERS.

DRAINAGE AREAS

Ware River at Intake Works = 96.8 Sq. Mi.
Swift River at Main Dam* = 186.0 Sq. Mi.

*Measurements Actually Made At U.S.G.S. Gaging Station At West Ware.

MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHED, 1938

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
WARE WATERSHED													
Ware River Intake Works*	3.99	2.37	2.31	3.15	3.70	8.99	8.62	3.08	16.13	2.25	3.65	3.01	61.25
West Rutland*	4.36	2.41	2.38	3.23	3.74	8.76	7.96	3.51	12.71	2.16	3.40	3.83	58.45
North Rutland	3.72	2.15	1.78	3.36	3.55	7.83	10.37	1.69	17.15	2.72	2.83	2.89	60.04
Williamsville	4.47	2.12	2.51	2.87	3.79	8.33	9.45	3.74	15.15	2.68	4.25	3.30	62.66
Hubbardston	3.56	1.80	2.45	3.28	4.36	8.67	8.00	2.58	18.28	2.36	3.09	2.91	61.34
1938 Mean	4.02	2.17	2.29	3.18	3.83	8.52	8.38	2.92	15.88	2.43	3.44	3.19	60.75
15-Year Mean	3.59	2.83	3.66	3.57	3.30	4.15	4.22	4.06	5.48	3.29	3.53	3.12	44.80
SWIFT WATERSHED													
West Ware	4.07	2.19	2.34	2.64	2.83	7.38	8.50	1.88	16.63	2.43	2.85	2.94	56.68
Enfield *	4.35	3.12	2.85	3.30	3.55	9.66	11.74	2.59	15.33	2.75	3.42	3.75	66.41
Greenwich	4.07	2.39	2.83	3.27	3.37	8.46	Discontinued						
Prescott	4.88	2.34	2.55	Discontinued									
Shutesbury	5.15	2.21	2.07	3.20	4.18	8.69	8.12	3.29	14.93	2.82	3.36	4.22	62.24
Wendell	5.51	2.15	2.17	3.16	4.76	8.51	7.18	3.91	14.25	2.33	3.56	4.02	62.01
Petersham**	4.57	2.39	2.12	3.05	4.05	7.43	8.19	3.29	15.78	2.17	3.97	3.73	60.74
1938 Mean***	4.73	2.41	2.31	3.07	3.87	8.34	8.75	2.99	15.39	2.60	3.43	3.73	61.62
19-Year Mean***	3.64	2.92	3.57	4.09	3.53	4.92	4.24	4.19	5.19	3.19	4.11	3.31	46.90

* Station maintained by the Metropolitan District Water Supply Commission.

** Station maintained by the Metropolitan District Commission.

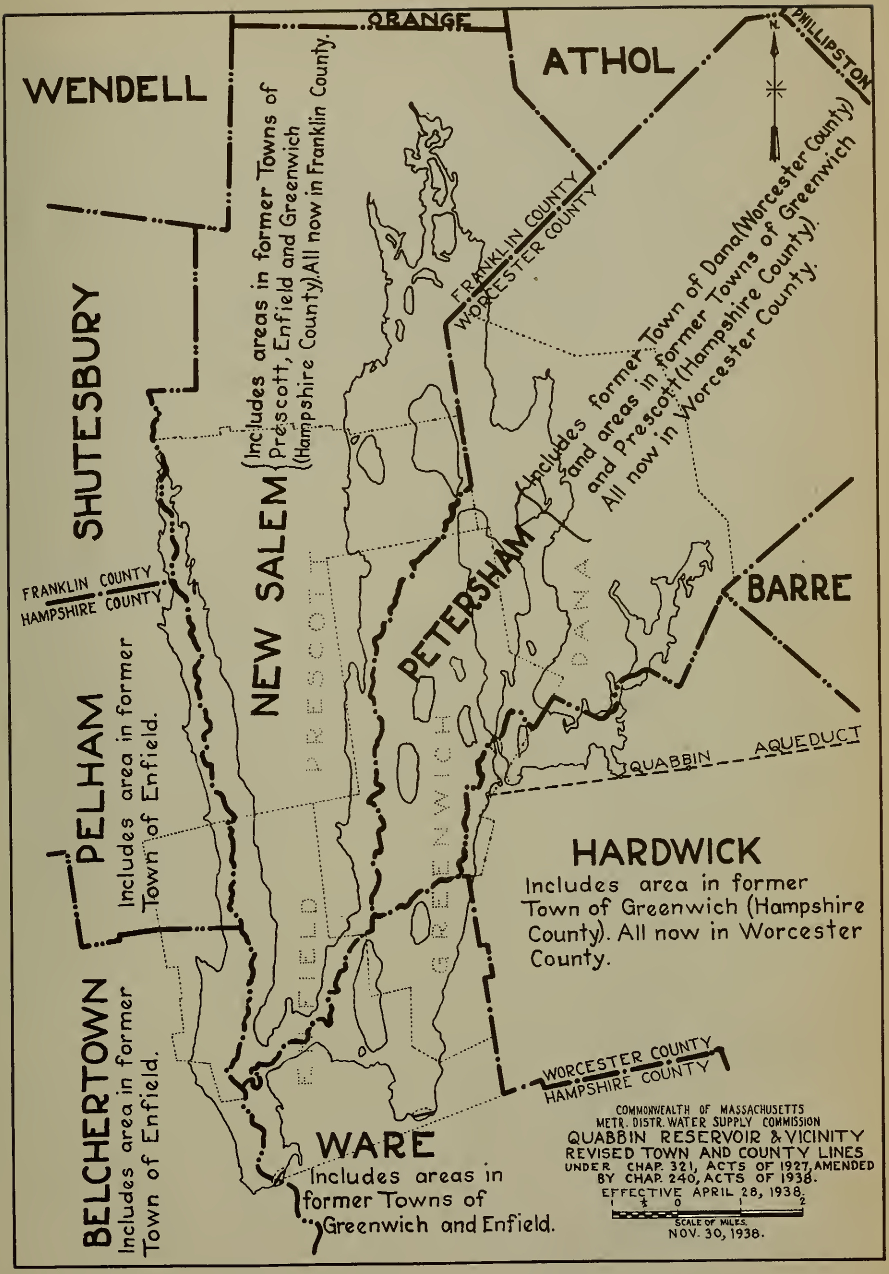
Data for all other stations obtained through courtesy of the State Department of Public Health.

*** Rainfall at the Greenwich and Prescott stations not included in these figures.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

SUBSTITUTE HIGHWAYS IN QUABBIN RESERVOIR AREA

DESCRIPTION	CONTRACT NO.	DATE	PAID BY DEPT. OF PUBLIC WORKS	PAID BY METR. DISTR. WATER SUPPLY COMM.	TOTAL FINAL ESTIMATE	WORK COMP.	TURNED OVER TO DEPT. OF PUBLIC WORKS
5.22 Miles, Ware-Belchertown Highway Route 9, in Ware and Belchertown.	21	July 20,'31.	$ 95,726.94	$ 129,980.25	$ 225,707.19	Aug. 22, '32.	Sept. 7, '32.
9.13 Miles, Daniel Shays Highway Route 202, in Belchertown and Pelham.	41	July 20,'33.	118,486.97	130,091.17	248,578.14	Nov. 20, '34	Dec. 4, '34.
7.61 Miles, Daniel Shays Highway Route 202, in Shutesbury and New Salem.	43	Aug. 25,'33.	120,567.89	267,037.58	387,605.47	Dec. 17, '34.	Jan. 8, '35.
4.10 Miles, Daniel Shays Highway Route 202, in New Salem and Orange.	44	Nov. 15,'33.	63,222.73	136,717.39	199,940.12	Nov. 20, '34.	Dec. 4, '34.
4.34 Miles, Petersham-New Salem Highway in Petersham.	55	June 23,'36.	110,991.47	128,165.18	239,156.65	July 19, '37.	Oct. 21, '37.
3.64 Miles, Petersham-New Salem Highway in New Salem.	57	Sept. 1,'36.	73,051.06	95,771.90	168,822.96	Sept. 29,'37.	Oct. 21, '37.
1.83 Miles of Hardwick-Petersham Highway in Petersham.	54	May 22,'36.	NONE	63,840.60	63,840.60	Nov. 17, '36.	DEEDED TO TOWN OF PETERSHAM May 27, '37.
35.87 MILES — TOTALS —			$ 582,047.06	$ 951,604.07	$ 1,533,651.13		


ORANGE
WENDELL
ATHOL
PHILLIPSTON
N.
SHUTESBURY
NEW SALEM
Includes areas in former Towns of Prescott, Enfield and Greenwich (Hampshire County). All now in Franklin County.
FRANKLIN COUNTY
WORCESTER COUNTY
PETERSHAM
Includes former Town of Dana (Worcester County) and areas in former Towns of Greenwich and Prescott (Hampshire County). All now in Worcester County.
FRANKLIN COUNTY
HAMPSHIRE COUNTY
PRESCOTT
DANA
BARRE
QUABBIN AQUEDUCT
PELHAM
Includes area in former Town of Enfield.
GREENWICH
ENFIELD
HARDWICK
Includes area in former Town of Greenwich (Hampshire County). All now in Worcester County.
WORCESTER COUNTY
HAMPSHIRE COUNTY
BELCHERTOWN
Includes area in former Town of Enfield.
WARE
Includes areas in former Towns of Greenwich and Enfield.
COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
QUABBIN RESERVOIR & VICINITY
REVISED TOWN AND COUNTY LINES
UNDER CHAP. 321, ACTS OF 1927, AMENDED BY CHAP. 240, ACTS OF 1938.
EFFECTIVE APRIL 28, 1938.
1 ½ 0 1 2
SCALE OF MILES.
NOV. 30, 1938.

Public Document No. 147

MASS.
DOCS.
COLL.

The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING NOVEMBER 30, 1939

Publication of this Document Approved by the Commission on Administration and Finance
1M-8-41-6945

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled.

The Metropolitan District Water Supply Commission established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1939, its

FOURTEENTH ANNUAL REPORT

I. Organization and Administration

Eugene C. Hultman continued as Chairman of the Commission and Thomas D. Lavelle and Edward J. Kelley as Associate Commissioners. R. Nelson Molt continued as Secretary.

During the past year the Commission's project for extending the sources of supply of the Metropolitan Water District westward from Wachusett Reservoir to the Ware and Swift rivers and Quabbin Reservoir authorized by Chapter 375 of the Acts of 1926, and Chapter 321 of the Acts of 1927 has been continued and the new pressure aqueduct project authorized by Chapter 460 as amended by Chapter 501 of the Acts of 1938, for by-passing many actual and potential sources of pollution and delivering the District's supply under sufficient pressure to eliminate much of the present pumping, has been prosecuted vigorously.

The contractor completing the Main Dam of Quabbin Reservoir, now known as Winsor Dam, sealed off the Diversion Tunnel in August allowing water to be stored in the Reservoir. The Commission, on October 5, 1939, formally made a taking of the waters of the Swift River in accordance with the provisions of Chapter 321 of the Acts of 1927.

There is still work to do on the spillway and control works at the main Winsor Dam of Quabbin Reservoir on reclearing as the reservoir fills, reforestation and fire stops, fencing, access roads and miscellaneous real estate surveys. The water in Quabbin Reservoir is already thirty-six feet deep above the original river bed at the dam and about 4 billion gallons have already been stored in this new reservoir so that even if the present severe drought should continue throughout the coming winter and spring, it need not cause any apprehension. Furthermore, the Quabbin Aqueduct tunnel has now been put in readiness for diversion westerly from the Ware River into Quabbin Reservoir and flood flows from the Ware watershed will hereafter be diverted to storage in this new basin.

Quabbin Reservoir will have a storage capacity of 415 billion gallons, and will flood about 39 square miles. Its construction necessitated relocating the boundaries of 6 towns and 3 counties, eliminating the towns of Dana, Enfield, Greenwich and Prescott, constructing about 36 miles of state highway to replace existing highways in the affected area, abandoning the Athol Branch (16 miles) of the Boston and Albany Railroad, constructing 8½ miles of relocated high tension electric transmission line, and acquiring for sanitary protection and construction purposes an area nearly 3 times that of the City of Boston. An important feature of the work is the removal of about 7500 bodies from cemeteries in the affected area to the new Quabbin Park Cemetery which the Commission has constructed in the Town of Ware.

The District is fortunate in finding a reservoir location so ideally suited to the requirements of water storage. It is located only about 65 miles from the State House in a very sparsely populated section of the State and it extends about 18 miles north from Winsor Dam and Quabbin Dike which dam the outlets and create the storage. The larger of the two, Winsor Dam, is 2640 feet long, 170 feet high above the bed of the Swift River, and 295 feet high including its core wall above the surface of sound ledge, and contains about 4 million cubic yards above the original surface. With the completion of the hydraulic work on Winsor Dam last year the Commission has successfully built by hydraulic-fill methods two structures which rank high in the list of important earth dams. This method of construction obtained, with the materials available, dams of excellent quality at substantial savings over other methods. Dams of hydraulic-fill construction are noted for their stability after construction. The hazards of building a hydraulic fill are greater during construction than is the case of other types. The construction of two hydraulic fills of this magnitude without a slide or other construction difficulty is an engineering feat in which the Commission takes just pride. The reservoir will be nearly as large as Lake Winnepesaukee in New Hampshire and will contain over 100 islands. Some of these rise so steeply from the Greenwich Plains that they have been called mountains. They will give to the flooded basin a unique beauty which cannot be rivaled in New England for magnitude and scenic effect, and which will attract many visitors. On this account the Commission is completing a highway between Winsor Dam and Quabbin Dike which will take sightseers to a large parking area on the top of Mount Quabbin from which a splendid view can be obtained in all directions, and particularly over the 175 miles of winding reservoir shore line to the north.

Travel has been discontinued on all roads leading into Quabbin Reservoir area, and hunting and fishing are prohibited within this reservation. Passes were issued only to former residents, employees of the Commission, or its contractors, men seeking employment on the clearing project, and others having necessary business in the area. Permanent custody of the records of the former towns of Dana, Enfield, Greenwich and Prescott, and also authority to issue certified copies of birth, death and marriage records of these former towns, were given to the Commission by the Legislature on May 5. The following amounts were expended during the year for welfare and old age assistance following in each case a thorough investigation of the claimant:

Town	Welfare	Old Age Assistance
Dana	$1,461.93	$1,527.89
Enfield	2,629.43	795.95
Prescott	—	30.00
Greenwich	570.49	153.34

The Commission's Quabbin Aqueduct through which the water will flow by gravity from Quabbin Reservoir to Wachusett Reservoir is a tunnel 24.6 miles long through solid rock, twice as long as the Simplon Tunnel under the Alps, but gives little surface indication of its existence except for the intake and outlet works and at the tops of the deep shafts, on several of which the Commission has erected buildings for housing hoisting equipment. The largest of these is the Ware River Intake Building in the Town of Barre. The Quabbin Aqueduct tunnel passes directly beneath the Ware River at this point and since the completion of the Intake Works in March, 1931, flood flows from the Ware have been dropped into the tunnel and diverted easterly to Wachusett Reservoir to an extent limited by the present storage capacity in that reservoir. They will now also be diverted westerly into the much larger Quabbin Reservoir. The underground drop from the Ware Intake to the tunnel is about twice as high as Niagara Falls.

At the time the recent legislation authorizing the Commission to accept Federal PWA grants was passed, it had spent a net total of about $41,300,000 of the total $65,000,000 originally appropriated for the Ware-Swift development and only about $11,600,000 needed to be spent to complete this development. The balance of about $12,000,000 represented a saving by this Commission on the originally estimated cost. This enabled the Legislature of 1938, without the necessity for appropriating any additional funds whatever, to authorize the construction of much needed improvements in the District's aqueduct and distribution system, on which the Legislature had requested a joint report by this Commission and the Department of Public Health, which was published as House Document No. 262 of the year 1938. The Legislature authorized, as a Federal Aid Project, not only the construction of the new pressure aqueduct but also the completion of certain portions of the Ware-Swift project which remained to be completed at that time and which could readily be adapted to inclusion in the entire PWA project, namely the items of clearing the site of Quabbin Reservoir, constructing dams for regulating shallow flowage in the upper reaches of the reservoir, constructing the road between Winsor Dam and Quabbin Dike, and completing the East Branch Baffle near the reservoir intake to Quabbin Aqueduct. However, although the Legislature reappropriated the sum represented by the Commission's savings, it at the same time placed a restriction on total expenditures prior to November 30, 1941, to a little more than $17,000,000 so that after making provisions to complete Winsor Dam and other existing construction, to settle real estate and diversion damage commitments, and to allow for all other claims not suitable for inclusion in the PWA project, a balance of $8,791,000.00 was available as the State's share of the PWA projects on which the Commission has been engaged during the past year.

The major item of this new PWA construction consists of about 18 miles of pressure aqueduct from the Wachusett Aqueduct terminal chamber to a shaft at the Charles River, from the bottom of which the aqueduct will be extended an additional 5 miles to Chestnut Hill as soon as consistent with the legislative restriction on the rate of expenditure.

This pressure aqueduct project is remarkable for the size of the pipe used as well as the speed of its construction. With the exception of a line of similar pipe 12 feet 8 inches in diameter constructed to distribute water to the Metropolitan District of Southern California as a part of the unprecedented Colorado River project, it contains the largest pipe of the sort ever made. It consists of precast units of steel-cylinder reinforced concrete pipe 12 feet 6 inches in diameter extending from the Wachusett Aqueduct terminal chamber to connect with a 14-foot tunnel underneath Sudbury Reservoir. East of this tunnel the aqueduct continues 11 feet 6 inches in diameter of similar steel-cylinder reinforced concrete pipe. Although the new high pressure will not be effective at Chestnut Hill until the aqueduct can later be extended to that point, the present PWA construction will end with a connection at the Charles River to the existing 60-inch steel Weston Aqueduct supply mains of the District which will be put under about 32 pounds per square inch additional pressure. This will increase their capacity to such extent that it will no longer be necessary to regularly use the old grade-line Sudbury Aqueduct of the District which has been in service for nearly 70 years and the leakage into which is one of the principal sources of pollution at the present time. The new pressure aqueduct is part of a plan of distribution which can be extended in the future to include a pressure-tunnel loop under the entire District capable of delivering water to all municipalities under heads equivalent to those which now require pumping at Chestnut Hill and Spot Pond. Such a tunnel will be located deep in the bed rock with only occasional shaft heads at the surface, and will eliminate the necessity for large hazardous surface mains of ever increasing size.

The progress made during the year in constructing the pressure aqueduct has been most satisfactory. The manufacture of fifteen miles of such large pipe in one season is a notable feature of the pressure aqueduct construction. Although the manufacturer was not awarded the contract until after the first of the year, he erected his plant, ordered his materials and manufactured and delivered the entire fifteen miles of exceedingly heavy pipe before the end of the year. This greatly aided the laying of long lengths of the aqueduct and avoided a rush in deliveries and laying which would have occurred if the manufacture of some of the pipe had been delayed until next season. The magnitude of this project might be better appreciated when it is considered that 183,000 barrels of cement, 23,000 tons of steel and 257 tons of lead went into the manufacture of the pipe and the lead gaskets. The delivery of the pipe units alone required the construction of 5 16-wheel trailer units which travelled the highways and specially built access roads continuously during the daylight hours making the necessary deliveries. Each of the several contractors for laying the pipe furnished unique and expensive equipment for handling this very heavy pipe, two contractors using specially-designed large gantry cranes which straddled the laying ditch, one using an improvised heavy locomotive crane which ran on rails in the bottom of the ditch, and another using two extra heavy speed cranes of the largest capacity built, working simultaneously as a unit. Each contractor demonstrated with his special equipment his ability to handle and lay these large heavy unwieldy units in a satisfactory manner and fast enough to keep ahead of the rigid progress schedule required to build this aqueduct in the short time allowed. The large units were laid around curves, uphill and downhill, across the countryside through open fields and woodlands and across roads, brooks and even the Sudbury River at an amazing pace so that by the end of the year the laying of pipe in place was practically completed on two of five contracts and completed except for a few hundred feet on two others. The excavation of the bore for the 14-foot tunnel extending 3 miles in solid rock under Sudbury Reservoir was practically completed (the actual final holing through being on December 19, 1939) and although work of this character can hardly be expected to be free from fatal accidents, the contractor completed the excavation in good time with no serious accidents of any sort, a really remarkable record.

The Commission commenced during the year the furnishing of materials for and the supervision of construction of a sewerage system for the Town of Holden. The Commission's sponsorship of this WPA project was described in last year's report.

On April 27 and 29 the Committee on Metropolitan Affairs inspected all the major features of the work and gave informal hearings in Athol and Ware on the possible adaptation of Quabbin Reservoir to the prevention of flood damage. On July 14 the Committee gave a hearing in Athol, Mass., on the question of the diversion of flood flows from the Millers River into the northerly end of Quabbin Reservoir at which it was brought out that Quabbin Reservoir, on account of its unique topographical situation, may at any time be used to materially assist a flood prevention program.

As in the previous year, the administrative functions of the Commission were greatly increased by the new pressure aqueduct construction. Its clerical force was augumented to keep pace with the additional work imposed by the requirements of the PWA and WPA projects. Three special agents under the direction of the Commission continued to care for the property acquired by the Commission in the Swift and Ware river areas and along the pressure aqueduct. Real estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 330 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 3212 persons. The force of local labor averaging 200 persons was employed during the year in forestry and reforestation work, the removal of bodies, and miscellaneous work of reclearing and burning the reservoir area in advance of the rise of water level.

The Commission regrets to report the death on January 30 of Frank E. Winsor who had been its Chief Engineer since the organization of the engineering division October 1, 1926. He had just returned from a short vacation in an attempt to recuperate his health and was stricken with a heart attack while testifying in the Commission's defense of a suit for damages.

He was born in Johnston, Rhode Island, November 16, 1870. In 1891 he received the degree of Ph.B. from Brown University and later the degree of C.E. in 1892, A.M. in 1896, and in 1929 the honorary degree of Sc.D. from the same institution. He began his engineering career with the Metropolitan Sewerage Commission of Massachusetts in 1891. Later, following a brief employment on the construction of a sewerage system for Natick, he joined the staff of the Metropolitan Water Board in 1895 and worked for about 5 years as an assistant in the Wachusett Dam and Reservoir and the Wachusett Aqueduct departments. Then he was promoted to Assistant Engineer in charge of the Weston Aqueduct Department office for 2½ years and Division Engineer in charge of the construction of about 2½ miles of the masonry section of Wachusett Aqueduct and also of the Happy Hollow Steel Pipe Siphon. Later he served the cities of New York and Providence in important capacities, being Department Engineer in charge of the Southern Aqueduct Department on the New York Board of Water Supply's Catskill Aqueduct, and for 11 years prior to 1926 as Chief Engineer of the Providence Water Supply Board.

He died at the height of a distinguished career and his loss was very keenly felt. Following his death, the Commission incorporated in its records the following: "The forty-seven years of service given to the public by Mr. Winsor, and the extensive works constructed under his supervision are a lasting memorial to his vision and industry. To his friends and associates his unlimited kindness and patience, his fidelity to all tasks entrusted to him, and above all his faithfulness to what he conceived to be right, constitute his true imperishable memorial." In memory of its former Chief Engineer, the Commission has named the main dam of Quabbin Reservoir, Winsor Dam.

The Commission regrets also to report the loss by death on September 26 of one of its principal consulting engineers, Thaddeus Merriman, who was formerly Chief Engineer of the New York Board of Water Supply, and at the time of his death was Consulting Engineer for that board, for the Metropolitan District of Southern California, for various agencies of the Federal Government, and many others. His accomplishments were outstanding and his loss is keenly felt.

II. Engineering Department

Following the death of Mr. Winsor above referred to, the Commission on March 9 appointed to the position of Chief Engineer Karl R. Kennison who had been connected with the work from its beginning, first as Designing Engineer and later as Assistant Chief Engineer. Stanley M. Dore was promoted to Assistant Chief Engineer and Charles L. Coburn to Principal Designing Engineer. William W. Peabody continued as Division Engineer, Quabbin Reservoir and Aqueduct Division, with offices at Winsor Dam in Belchertown and at the Ware River Intake Works in Barre; Frederick W. Gow continued as Division Engineer, Southborough-Framingham Division, with office in Marlborough; and Coleman C. McCully as Division Engineer, Wayland-Weston Division, with office in Natick. Consultants were employed from time to time as required on matters of design; and when neccessary, at the request of the Attorney General, in the preparation of data for the defense of petitions for damages against the Commonwealth; and for the collection and interpretation of data on mill and water power damages.

III. Offices

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission building at 20 Somerset Street, Boston. Offices at various places on the work were occupied from time to time as required, and the office of the Quabbin Reservoir Division and the laboratories for water analysis and soil testing were continued in Belchertown, the equipment of the latter being moved during the year to a new soil testing laboratory at Natick. The office of the Wayland-Weston Division was continued at 35 Main Street, Natick, and of the Southborough-Framingham Division, at 4 Walker Street, Marlborough.

IV. Real Estate and Water Rights

The Commission, for reservoir purposes and sanitary protection, has acquired a total to date of approximately 80,169 acres of land in the Swift River watershed; for sanitary protection and construction purposes in the Ware River watershed, a total of about 15,146 acres; and for construction purposes along the line of the pressure aqueduct, about 611 acres.

All property within the reservoir area was vacated incidental to the clearing operations. The Commission has collected a total of $1,044,193.19 in sales and rentals and salvage of property acquired by it from the commencement of its operations to the end of this fiscal year. This includes salvage from hurricane timber, sold to the Federal Government. This Commission has been able thus to realize from its fallen timber and also reduce its fire hazards to a measurable degree.

V. Swift River Supply

The Commission continued its reforestation program and fire lanes were kept clear above the flow line of Quabbin Reservoir, affording protection to the new transplants as well as to existing areas of standing timber. A force of local labor averaging 22 men was employed for 38 intermittent weeks during the year in forestry and reforestation work; an average of 14 men were employed for all but 3 weeks throughout the year in the removal of bodies to Quabbin Park and outside cemeteries; and an average of 53 men were employed for the last weeks of the year in the miscellaneous work of reclearing and burning the reservoir area in advance of the rise of water level.

The Benjamin Foster Company continued work under Contract No. 52 for constructing the embankment of Winsor Dam in the towns of Belchertown and Ware. The entire embankment of about 4 million cubic yards was completed. The tunnel which has carried the river around the site was plugged and the construction of the spillway and outlet works was well advanced.

Coleman Bros. Corporation completed the work under PWA Contracts Nos. 61, 62 and 63 for clearing portions of Quabbin Reservoir.

The C. & R. Construction Company continued to practical completion the work under PWA Contract No. 66 for constructing regulating dams on the Middle and East Branches of the reservoir in the towns of New Salem, Hardwick and Petersham, and under PWA Contract No. 72 for clearing a portion of Quabbin Reservoir.

The policy of publicly advertising for bidders on all contracts was continued and PWA Contract No. 82 for constructing the Administration Road between Winsor Dam and Quabbin Dike in the Town of Ware was awarded on March 9th to G. Rotondi & Son, Melrose, the lowest bidder. Work is in progress under this contract.

Warner Bros. & Goodwin Inc. completed the work under Contract No. 88 for furnishing and storing topsoil in the Town of Ware.

PWA Contract No. 93 for completing the East Branch Baffle in the towns of Petersham and Hardwick was awarded October 19 to J. J. Callahan, Boston, the lowest bidder. Work was practically completed under this contract.

VI. Ware River Supply

The Rutland-Holden sewer was operated throughout the year to divert from the Ware and Wachusett watersheds the sewage of the U. S. Veteran's Hospital and the State Sanatorium in Rutland.

Water was diverted from the Ware River from time to time May 10 to 31 and November 1 to 7, inclusive, and the temporary chlorinating plant in the upper watershed of the Ware River was operated from time to time as required.

Real estate and topographical surveys were carried on during the year and preparation of record and taking plans of property acquired was continued.

A force of local labor averaging 30 persons was employed for 39 intermittent weeks during the year in cleaning up hurricane debris and in addition the Commission made miscellaneous sales of hurricane-felled lumber.

VII. Pressure Aqueduct

PWA Contract No. 74 for constructing the Southborough Tunnel, Section 2 of the Pressure Aqueduct in the Town of Southborough, was awarded on

December 17, 1938, to the West Construction Company, Boston, the lowest bidder. Work is in progress under this contract.

PWA Contracts Nos. 75 and 77 for laying the pipe and constructing cut-and-cover aqueduct in Sections 1 and 3 of the pressure aqueduct in the towns of Marlborough, Southborough and Framingham, were awarded on March 9 and April 18, respectively, to B. A. Gardetto Inc., Boston, the lowest bidder. Work is in progress under these contracts.

Sprague and Henwood Inc. completed work under PWA Contract No. 76 for making core borings along the pressure aqueduct line.

PWA Contracts Nos. 78 and 79 for laying the pipe and constructing cut-and-cover aqueduct in Sections 4 and 5 of the pressure aqueduct in the towns of Framingham, Wayland, Natick and Weston, were awarded on March 18 to the American Concrete and Steel Pipe Company, Los Angeles, California, the lowest bidder. Work is in progress under these contracts.

PWA Contract No. 80 for constructing Norumbega Reservoir in the Town of Weston was awarded on June 1 to Carlo Bianchi & Company, Inc., Framingham, the lowest bidder. Work is in progress under this contract.

PWA Contract No. 81 for laying the pipe and constructing cut-and-cover aqueduct in Section 6 of the pressure aqueduct in the Town of Weston, was awarded on April 18 to M. F. Gaddis Inc., Boston, the lowest bidder. Work is in progress under this contract.

A large number of PWA equipment contracts for furnishing valves and other materials and equipment required for the pressure aqueduct, the Weston Aqueduct, and the Spot Pond By-Pass were awarded in each case to the lowest bidder. Particularly notable among these was Contract No. 85 for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston, which was awarded on December 28, 1938 to the Lock Joint Pipe Company, Ampere, New Jersey, the lowest bidder.

VIII. Weston Aqueduct Siphons

The Leo Butler Company, Katonah, New York, continued to practical completion work under PWA Contract No. 73 for constructing inverted pipe siphons on the Weston Aqueduct.

PWA Contract No. 89 for constructing mortar lining in the steel pipe siphons of the Weston Aqueduct in the towns of Framingham and Wayland, was awarded on October 26 to Marinucci Bros. & Co., Boston, the lowest bidder. Work is in progress under this contract.

IX. Spot Pond and Northern High Service.

PWA Contract No. 83 for constructing the Spot Pond By-Pass in the Town of Stoneham and the City of Medford, was awarded on August 10 to S. Rotondi & Sons Co., Stoneham, the lowest bidder. Work is in progress under this contract.

X. General

The engineering force continued its studies for the development of hydro-electric power at various points on the work. No electric power can be generated, however, until the filling of Quabbin Reservoir provides the necessary storage of water.

Studies were made of the Charles River Shaft, at the east end of the cut-and-cover pressure aqueduct, and of the proposed deep rock pressure tunnel to Chestnut Hill.

On March 5, 1937, a petition was filed in the Superior Court for Suffolk County against the Metropolitan District Water Supply Commission by the Franklin A. Snow Company, setting forth certain additional claims amounting to $191,767.62 in connection with work done under Contract No. 51. The matter was fully heard by an auditor and before the court, and on Sept. 25, 1939, after an appeal to the Supreme Judicial Court of the Commonwealth, judgment was entered for the petitioner in the amount of $8,712.98 plus costs of suit in the amount of $366.10.

The defense of a suit brought by The Arthur A. Johnson Corporation in connection with the work done under Contract No. 50 was continued by the Attorney General.

XI. CEMETERIES

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 953 bodies were removed from the Quabbin Reservoir area during the year, of which 911 were reinterred in Quabbin Park Cemetery. To date a total of 6,180 bodies have been removed from the Quabbin Reservoir area, of which 5,236 were reinterred in Quabbin Park Cemetery. There have been 19 original burials during the year in Quabbin Park Cemetery, making a total to date of 133 original burials in this cemetery. The removal of bodies from the Quabbin Reservoir area which is being flooded has been completed. Landscaping and maintenance studies for a permanent Service Building have been continued during the year.

XII. FINANCIAL

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

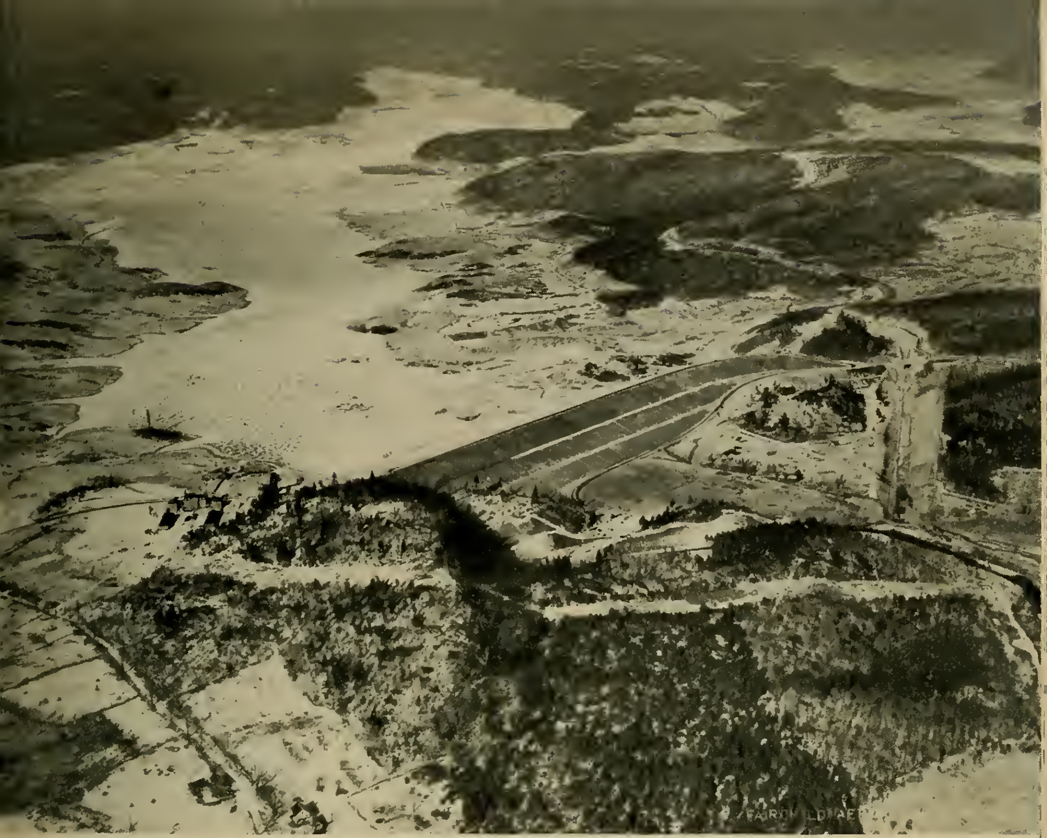
XIII. OTHER REPORTS

The report of the Chief Engineer is herewith presented.

Respectfully submitted,

E. C. HULTMAN, *Chairman*
THOMAS D. LAVELLE, *Associate Commissioner*
EDWARD J. KELLEY, *Associate Commissioner*

20 SOMERSET STREET, BOSTON, MASSACHUSETTS.
January 15, 1940.



Fairchild Aerial Surveys, I

Quabbin Reservoir.—Looking north. Snow on the cleared areas shows the general reservoir outline, particularly the West Branch, 11 miles long. The Middle Branch extends 9 miles further north from the prominent Mt. Pomeroy Island in the distance at right.

Winsor Dam.—In center foreground. Outlet channel from stream-control tunnel in foreground. Spillway channel at right.

Administration Buildings.—In foreground at left.

Administration Road.—Winds up hill from Winsor Dam spillway to the parking area at top of Quabbin Hill, extreme right.

Enfield Village was located in the narrow valley which connects the West and Middle branches and which runs between Quabbin Hill and the more distant Prescott peninsula.

Relocation of New England Power Company's 66,000-Volt Transmission Line.—Cleared strip across the foreground.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

Gentlemen:—The following is a report of the engineering department for the year ending November 30, 1939.

Organization

In addition to work on the Ware and Swift river project, the work of constructing the new pressure aqueduct with Federal aid, as a PWA project, has been vigorously prosecuted during the year and the Federal requirements as to completion during the first half of 1940 have necessitated a considerable increase in the engineering organization amounting to 94 per cent during the year.

The work was continued under Frank E. Winsor, Chief Engineer, until his untimely death in the Boston Office on January 30. He died at the very height of a distinguished career as an engineer and public servant, and will be remembered among his associates for his integrity, his cooperative spirit and his sympathetic interest, as well as for his important professional achievements and services. Following his death, the Commission named the main dam of Quabbin Reservoir "Winsor Dam" as an appropriate recognition of his services.

He was succeeded as Chief Engineer by Karl R. Kennison March 9. At the same time Stanley M. Dore was promoted to Assistant Chief Engineer in charge of studies in connection with the general plan and design of the work, the preparation of specifications and the prosecution of construction contracts, and Charles L. Coburn was promoted to Principal Designing Engineer in charge of the design of structures, the preparation of specifications and contract and working drawings, and he continued his general office supervision. Walton H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages, and has been in charge of the preparation of specifications and the purchase and installation of equipment. On June 1 Lawrence M. Gentleman was promoted to Associate Civil Engineer in charge of the detail work of design and contract and working drawings.

Three division engineers continued in charge of field divisions as follows: William W. Peabody, Quabbin Reservoir and Aqueduct Division; Frederick W. Gow, Southborough-Framingham Division; Coleman C. McCully, Wayland-Weston Division.

Thaddeus Merriman continued as consulting engineer until his death on September 26. His loss was keenly felt. James F. Sanborn, consulting engineer of New York, was employed in place of Mr. Merriman. Charles T. Main, consulting engineer of Boston, Warren J. Mead, geologist of Massachusetts Institute of Technology, and other experts were employed from time to time.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1938	Nov. 30, 1939
Headquarters Office, Designing Division	46	78
Coldbrook Office, Quabbin Reservoir and Aqueduct Division	14	17
Belchertown Office (formerly in Enfield) Quabbin Reservoir and Aqueduct Division	98	97
Marlborough Office, Southborough-Framingham Division	19	102
Natick Office, Wayland-Weston Division	45	137
Total Engineering Force	222	431

The maximum force during the year was 432, during the week ending November 25. The minimum force was 222, during the week ending December 3, 1938. The average force for the year was 330.

OFFICES

The office of the Chief Engineer and of the Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. At the completion of the Commission's administration buildings at Belchertown, west of Winsor Dam, the Reservoir Office of the Quabbin Reservoir and Aqueduct Division was moved to this permanent location from the property formerly known as the Frances W. Chandler house on Quabbin Road in Enfield. The property formerly known as the Barlow house in Enfield, which housed the Commission's water analysis and soil testing laboratories, was destroyed by fire March 23. The equipment was moved to the Commission's vacated office in the Chandler house and the laboratories were continued there throughout the year. The Aqueduct Office of the Quabbin Reservoir and Aqueduct Division in the Ware River intake building and in the adjoining newly constructed service building, in Coldbrook, was continued throughout the year. The office of the Southborough-Framingham Division at 4 Walker Street, Marlborough, and the office of the Wayland-Weston Division at 35 Main Street, Natick, were continued throughout the year. Branch offices were maintained at other locations where work under important contracts was in progress.

HEADQUARTERS OFFICE

Summary of the Year's Work

Watershed Real Estate.—Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 505 acres outside the general taking line, making a total reported on to date of 11,632 acres outside the general taking of 74,886 acres. A summary of all real estate acquired for the Quabbin Reservoir and its sanitary protection is shown in an appended table and includes takings outside the watershed areas for construction purposes.

ACQUISITION OF REAL ESTATE FOR QUABBIN RESERVOIR

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1939	34
Total to Nov. 30, 1938	80,135
Total to Nov. 30, 1939	80,169

Options outstanding Nov. 30, 1939, include 155 acres.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 2,379 acres, making a total reported on to date of 25,731 acres.

ACQUISITION OF REAL ESTATE FOR WARE RIVER WATERSHED PROTECTION

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1939	395
Total to Nov. 30, 1938	14,751
Total to Nov. 30, 1939	15,146

Options outstanding Nov. 30, 1939, include 1,046 acres.

An appended table shows all real estate taking plans prepared and filed during this and previous years and includes takings outside the watershed area for construction purposes.

Water Diversion Damage Claims.—The preparation of data for use of attorneys in anticipated water diversion cases was continued.

Contracts and Specifications.—Contract 74, a PWA contract, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct, in the Town of Southborough, was executed December 30, 1938.

Plans and specifications were prepared for Contracts 75, 77, 78, 79 and 81, PWA contracts, for laying the pipe and constructing cut-and-cover aqueduct in Sections 1, 3, 4, 5 and 6, respectively, of the pressure aqueduct in the towns of Marlborough, Southborough, Framingham, Wayland, Natick and Weston. Contract 75 was executed March 13; Contract 77, May 3; Contracts 78 and 79, March 20; and Contract 81, April 26.

Plans and specifications were prepared for Contract 80, a PWA contract, for constructing a high-level distribution reservoir, known as Norumbega Reservoir, in the Town of Weston. The contract was executed June 15.

Plans and specifications were prepared for Contract 82, a PWA contract, for constructing the Administration Road on Quabbin Hill between Winsor Dam and Quabbin Dike in the Town of Ware. The contract was executed March 9.

Plans and specifications were prepared for Contract 83, a PWA contract, for constructing the Spot Pond By-pass in the Town of Stoneham and City of Medford. The contract was executed August 29.

Contract 85, a PWA contract, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston, was executed December 28, 1938.

Plans and specifications were prepared and the contracts executed for Contracts 86, 87, 90, 91 and 92, PWA contracts, for furnishing valves and other equipment required for the pressure aqueduct, the Weston Aqueduct siphons, and the Spot Pond By-pass.

Plans and specifications were prepared for Contract 89, a PWA contract, for constructing mortar lining in the old steel pipe siphons of the Weston Aqueduct in the towns of Framingham and Wayland. The contract was executed November 6, following the practical completion of the new siphon lines of precast steel-cylinder reinforced concrete pressure pipe, under Contract 73, which permitted the old lines to be shut down for cleaning and lining.

Plans and specifications were prepared for Contract 93, a PWA contract, for completing the East Branch Baffle in the Town of Petersham (in an area formerly in the Town of Greenwich) and in the Town of Hardwick, to fill the highway gap which had been left under Contract 51. The contract was executed October 27.

Plans and specifications were prepared for Contract 98, for removing the steel bulkhead from Quabbin Aqueduct Tunnel in the Town of Barre, which was constructed in 1930 under Contract 17 to prevent any flow westerly from the Ware River intake until Quabbin Reservoir could be made ready for storage. The contract was executed September 22.

Plans and specifications were prepared for Contract 99, a PWA contract, for enlarging the Fells high-level distribution reservoir in the Town of Stoneham and the cities of Malden and Melrose. The contract was advertised for the opening of bids December 21, 1939.

Plans and specifications were prepared for Contract 100, a PWA contract, for constructing mortar lining in the Wachusett Aqueduct Assabet River bridge crossing in the Town of Northborough. The contract was executed October 27.

Working drawings for Contracts 52, 64, 66, 73, 74, 75, 77, 78, 79, 80, 81 and 83 were prepared and issued.

Inspection and Tests.—The New England Inspection Bureau continued the testing of cement purchased under A.S.T.M. specifications and tested road surfacing material furnished under Contract 82. New specifications for Portland cement were prepared, based on exhaustive research for the New York Board of Water Supply by the Commission's consulting engineer, the late Thaddeus Merriman, which required inspection during as well as after the manufacturing process. The use of cement manufactured, tested and delivered in accordance with these specifications has resulted in marked improvement in the quality and strength of concrete. The Thompson & Lichtner Co., Inc., Boston, Mass., were employed to test cement under these new specifications, also to test samples of welding from steel cylinders manufactured under Contract 85. Charles Goetz of Los Angeles, California, was employed to inspect and test equipment manufactured in San Francisco and furnished under Contract 87-B for the Weston Aqueduct connection at Sudbury Dam. William R. Conard of Burlington, New Jersey, was employed to inspect special castings furnished under Contract 52 for the outlet works at Winsor Dam. The Worcester Polytechnic Laboratory continued testing concrete cylinders for Contract 52. Tests of concrete aggregates and of concrete cylinders for all other concrete work were made by the engineering force principally at the Natick laboratories. Miscellaneous steel and iron for use on all contracts, electrical equipment for Contract 56, and fence material for Contracts 78, 79, 81 and 83 were inspected by the engineering force and samples tested at the Quabbin laboratory. The inspection of manufacture and the testing of gate valves, pivot valves, air valves, sluice gates, special castings and other mechanical equipment furnished under Contracts 86, 87, 90, 91 and 92 were handled by an inspector employed for the purpose and attached to the headquarters' engineering staff, who has devoted his entire time to such work.

Hydrographic Data.—The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was promptly rebuilt after the flood of last September and was continued in cooperation with that company and the U. S. Geological Survey.

Cooperation with the U. S. Geological Survey in the operation and maintenance of the gaging stations on the East Branch of the Swift River near the outlet of Pottapaug Pond at the regulating dam built under Contract 66 in Hardwick, and on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations.

Ware River Diversion

Ware River water was diverted into Wachusett Reservoir intermittently May 10 to 31, and November 1 to 7, inclusive. The quantity of water diverted during the year was 524,500,000 gallons. The steel bulkhead and gates about 2,200 feet west of Shaft 8 were removed during the week ending September 30, so that diversions from the Ware River may now be made westerly into Quabbin Reservoir. However, the entire diversion this year was made easterly into Wachusett Reservoir in order to replenish its depleted storage.

Sewage Diversion from Ware River Watershed

The Rutland-Holden Sewer continued in operation. During the fiscal year of the City of Worcester, which includes the 12 months ending December 31, 1939, 61,226,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 29,909,000 gallons came from the U. S. Veterans Hospital.

Portion of Work under PWA

Good progress has been made on all the items of work previously reported as included under the two Federal grants as follows:

PWA Docket No. Mass. 1520-F, Mass. State Project D-202
PWA Docket No. Mass. 1551-F, Mass. State Project D-208

Under the latter, several new items were undertaken during the year, including the following:

Completing the East Branch Baffle at Quabbin Reservoir.—This consists of filling the gap which had to be left at the northwest end of the original baffle, for the highway, Route 21, through the Swift River valley, pending the completion of Quabbin Reservoir.

Waterproofing the Assabet River Bridge of Wachusett Aqueduct.—This is necessitated by conditions created by the new pressure aqueduct. Until now the Wachusett Aqueduct has discharged freely into the open channel leading to Sudbury Reservoir with several feet loss of head at the Wachusett Aqueduct terminal chamber. The operation of the new pressure aqueduct will utilize all of this head and will result in some backing up from the new pressure aqueduct intake. The hydraulic grade line near the outlet of the aqueduct and at the Assabet River bridge will be appreciably higher than before and on this account it was found necessary to waterproof the aqueduct at the bridge crossing to prevent excessive leakage.

Enlargement of the Fells Reservoir.—This will provide a suitable distribution reservoir north of the proposed future distribution tunnel loop under the District, to match the new high-level distribution reservoir near the end of the new pressure aqueduct. Its construction at this time will allow greater flexibility in the pumping schedule at Spot Pond Station to accommodate the new conditions of operation under which Chestnut Hill and Spot Pond are expected to be eliminated from regular use and held in reserve.

Sinking the Charles River Shaft.—This shaft will connect the new pressure aqueduct now under construction with its proposed extension to Chestnut Hill through the first section of the proposed future distribution tunnel loop.

Design of Structures

Winsor Dam.—Designs were made for monumental pylons to be erected in central grassplots at the two ends of the dam, and for gateways to be erected at the east and west entrances to the access roads to the administration buildings and Winsor Dam. Studies were made and designs completed for the spillway located in the rock cut east of the dam. The final design includes a flood control feature consisting of a depressed section two feet below the normal flow line controlled by stop logs and having five 8-foot spans between piers which support a runway for handling the stop logs.

Power Development at Winsor Dam Outlet Works.—Studies were made and designs completed for the foundations of the outlet works downstream from the stream control tunnel at Winsor Dam, for the 68-inch outlet conduit extending from the intake to the outlet works and for releasing water from the completed reservoir. This parallels the first 48-inch pipe embedded in the tunnel invert under Contract 30 so that there will be two outlets, one 48-inch and one 68-inch, leading from the bottom of the two wells in the intake shaft just upstream from the center line of the dam. The designs included provisions for the installation, as soon as required, of hydraulic power units.

Administration Road.—Studies and designs were completed of the highway between Winsor Dam and Quabbin Dike including a large parking area near the top of Quabbin Hill.

Winsor Memorial.—Studies and designs were made in cooperation with a committee representing the Boston Society of Civil Engineers and the Northeastern Section of the American Society of Civil Engineers, appointed November 15, to sponsor the erection of a suitable memorial to the late Chief Engineer of the Commission, Frank E. Winsor. This memorial will be located alongside the Administration Road at Quabbin Reservoir overlooking Winsor Dam.

Quabbin Park Cemetery.—Studies and designs were made for a service building and memorial center in Quabbin Park Cemetery.

Quabbin Aqueduct.—One-way shutters were designed and purchased for installation in the head works at Shaft 11A, which is the outlet into Quabbin Reservoir for diversions from the Ware River.

Rutland-Holden Sewer.—Studies and designs were completed for sewage systems in the towns of Rutland and Holden and their connection to the Rutland-Holden Sewer.

Weston Aqueduct Siphons.—Studies and designs were completed for the additional pipe lines and appurtenances at the Sudbury River and Happy

Hollow siphons necessary to bring the Weston Aqueduct up to its designed capacity. Four gates and hoists for installation in the old gatehouses to control the flow in the new pipe lines, 12 to 16-inch blow-off gate valves, and special pipe fittings were purchased under PWA equipment contracts.

Wachusett Aqueduct.—Studies were made of the hydraulic conditions in the Wachusett Aqueduct terminal chamber. Until now there has been unrestricted free discharge into the upper end of the open channel in which the water level has averaged about 275 feet above mean low tide. The new pressure aqueduct is designed to take the water from this point at elevation 278. This requires the maximum possible conservation of head through the outlet structure together with the maximum permissible elevation of the free water surface in the aqueduct. Materials were purchased for the installation in the terminal chamber of steel baffle plates, to provide smooth waterways and a minimum loss of head discharging into the open channel. The aqueduct was unwatered and the bridge across the Assabet River entered for inspection September 2. The brick lining was found in excellent condition. Studies and designs were completed for the lining of the bridge and its approaches including the filling of cracks and reinforcing of the old sheet lead in the lining.

Quinapoxet River Diversion.—Studies were continued relative to diverting into the Quabbin Aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

Pressure Aqueduct Line.—Studies and designs were comlpeted for the new pressure aqueduct from the Wachusett Aqueduct terminal chamber in Marlborough to the Charles River Shaft in Weston and to a connection with the Weston Aqueduct supply mains to the water district in Weston near Norumbega Park. In general a strip of land was taken in fee for a width of 125 feet, 40 feet on the north side and 85 feet on the south, including room for a future parallel line. An additional width generally 50 feet wide was taken as a temporary construction easement to provide space for the delivery of pipe by the manufacturer to the laying contractors. Air relief valves, 1½-inch for manual and 8-inch for automatic operation, and gate valves varying from 8 to 30 inches for miscellaneous blow-offs and for branches to future connections were purchased under PWA equipment contracts for installation along the aqueduct line.

Section 1 of Pressure Aqueduct.—Studies and designs were completed for the equalizing basin, emergency overflow spillway, intake chamber and the 12-foot 6-inch cut-and-cover aqueduct which will supply the downtake shaft of the Southborough Tunnel to Sudbury Reservoir. All drainage of areas adjacent to the equalizing basin is diverted downstream from the aqueduct intake. A 36 x 60-inch sluice gate and a 1½-ton chain hoist were purchased under PWA equipment contracts for installation as a by-pass through the emergency spillway.

Section 2 of Pressure Aqueduct. Southborough Tunnel.—Studies and designs were continued for the Southborough Tunnel to Sudbury Reservoir, particularly for the dry well and pump chamber at the bottom of Shaft 4, for unwatering the tunnel and for the provisions for an emergency cross connection to Weston Aqueduct at Sudbury Dam.

The following equipment was purchased under PWA equipment contracts for installation at Shaft 4:

1 114 x 69-inch Venturi meter.
1 20-inch hydraulically-operated gate valve for emergency use on the tunnel unwatering pump.
1 20-M.G.D. capacity tunnel unwatering pump for operation with the Commission's 900 horsepower motor already purchased for use at Shaft 1 of Quabbin Aqueduct.
1 Deep well sump pump.
1 24-inch tide gate on pump discharge.
1 Air blower.
1 8-ton chain hoist.
Miscellaneous 18 to 20-inch gate valves.
Special pipe fittings.

Pressure Aqueduct East of Sudbury Dam.—Studies and designs were completed for Sections 3, 4, 5 and 6 of the pressure aqueduct, 11-foot 6-inch cut-and-cover, including connections to existing Weston Aqueduct supply mains in Weston and to the Weston Aqueduct terminal chamber. These connections will permit increased pressure from this new aqueduct to be put on the Commission's 60-inch water mains which run northerly to Belmont, Arlington and Spot Pond and easterly to Brighton. Provisions were also made which will permit the future installation near and easterly of the Weston Aqueduct terminal chamber, of pumping equipment which can augment the high-pressure service by taking water from the Weston Aqueduct and Weston Reservoir and lifting it about 75 feet into the new pressure aqueduct. The occasional operation of such pumping equipment during future peak demands may make unnecessary, and will in any event materially postpone the addition of a second pressure aqueduct line parelleling the one now being built.

The following equipment was purchased under PWA equipment contracts for installation on Section 3, to regulate the flow in the new aqueduct:

6 72-inch Dow-disc valves.
2 24-inch pressure relief valves.

and on the connection to the Weston Aqueduct headworks:

1 42 x 24-inch Venturi meter.
1 30 x 24-inch meter valve.
Miscellaneous 24 to 48-inch gate valves and special pipe fittings.

and for installation on Section 6 at the connection with the Weston Aqueduct supply mains:

Miscellaneous 36 to 60-inch gate valves and special pipe fittings.

Norumbega Reservoir.—Studies and designs were completed for the new distribution reservoir in the Town of Weston, which the Commission has named Norumbega Reservoir. The designs include an operating building with provisions for handling and cleaning screens and for chlorination and ammoniation to the extent found necessary and also a small storehouse for miscellaneous equipment and for the storage and handling of chlorine. A 7½-KVA electric generating unit and a 3-ton hoist were purchased under PWA equipment contracts for installation in the regulating works at the reservoir outlet.

Spot Pond By-pass.—Studies and designs were made for a 60-inch pipe line along the shore of Spot Pond between the south gatehouse and the Spot Pond pumping station on the east side of the pond. This line is designed to supply the pumps directly from the District's supply mains so that the supply will not pass through the pond itself as at present. In this way the regular use of the pond will be eliminated and it will be called upon only to ride on the system at the level of the pump sump. The design includes an automatic emergency gate which will permit the pumps to draw from Spot Pond whenever the necessity arises, and an emergency overflow into Spot Pond in case the pumps are suddenly shut down for any reason. Studies made included provisions for an additional Diesel engine-driven pump with a capacity of 5 million gallons a day which will serve the Bear Hill Reservoir, and eliminate the necessity of throttling the discharge of the present units pumping to Fells Reservoir in order to provide the additional 30 feet head to the Bear Hill Reservoir. The 60-inch valve above referred to and other miscellaneous valves required for this by-pass were purchased under PWA equipment contracts.

The following equipment was purchased under PWA equipment contracts for installation on the Spot Pond connection:

1 8-inch air relief cluster.
2 12-inch blow-offs.
Miscellaneous gate valves varying from 36 to 48 inches.
1 48-inch automatically-regulated Dow-disc valve.
1 48-inch pivot-disc check valve.
1 10-ton chain hoist.
1 Deep well sump pump.
Special pipe fittings.

Enlargement of Fells Reservoir.—Studies and designs were made for the enlargement of the Fells Reservoir of the northern high service by the construction of two additional basins which will be adjacent to the existing reservoir on the east and south sides and which will practically double its area and the effective storage. The designs provide for continuing the present gatehouse and screen chamber. Until the completion of the pressure tunnel loop beneath the distribution system of the entire District, this reservoir will be supplied by pumping from the Spot Pond pumping station as at present, with the exception that increased reservoir capacity will permit a more flexible operation of this pumping station and a more nearly constant 24-hour flow from the new pressure aqueduct and the Weston Aqueduct supply mains. This will permit the early elimination from regular use of the old Sudbury Aqueduct, which now has to be used to a limited extent on account of the inadequacy of the supply mains from the Weston Aqueduct.

Charles River Shaft.—Studies and designs were made for a downtake shaft just west of the Charles River near the Nickerson Athletic Field of Boston University. This shaft layout includes the end of the new pressure aqueduct which is being constructed as a PWA project. The design provides for sinking a shaft through overlying sand and gravel and deep into the sound ledge, with provision for two waterway downtake wells, one for the tunnel to Chestnut Hill and one for the future tunnel northerly to complete the tunnel loop under the District, also a dry well for access to a pump chamber at the bottom of the shaft to permit unwatering of both branches of the future tunnel loop. The design provides for the installation of gates at a convenient location on the surface instead of at the bottom of the deep shaft and for the installation of Venturi meters in each of the downtake wells.

Tunnel to Chestnut Hill.—Studies were made of the tunnel to Chestnut Hill, the construction of which will be undertaken as the next step following the completion of the PWA pressure aqueduct project. When it is completed, pumping at the Chestnut Hill pumping station can be discontinued and the Chestnut Hill Reservoir eliminated from regular use and held in reserve.

Sudbury Dam Power Plant

The new pressure aqueduct by-passing Sudbury Reservoir and supplying Weston Aqueduct through cross connections from the new control chamber just below Sudbury Dam will make obsolete the two water-wheel units which are now used to generate power from water released from Sudbury Reservoir into the Weston Aqueduct, and will materially affect the conditions under which the third unit, generating power from the water released from Sudbury Reservoir into Framingham Reservoir No. 3, will be operated. During the year the headquarters office supervised the making of extensive repairs to the latter unit, to insure its proper operation for the supply of electric energy to contractors laying the aqueduct pipe and constructing the tunnel under Sudbury Reservoir. The repairs commenced September 26 and the unit received its final test October 25.

Progress of Contracts

The following construction work was not included in any of the three field divisions but on account of its location was carried out under the supervision of the headquarters office.

Contract 83.—Bids were opened August 3 for constructing the Spot Pond By-pass in the Town of Stoneham and the City of Medford. This is a PWA contract. Twelve bids were received, ranging from $143,928.28 to $196,640.80, all from Massachusetts contractors except one from New York and one from Maryland. The contract was executed August 29 with S. Rotondi & Sons Co., Stoneham, Mass., the lowest bidder. The work consists of laying about 4,400 feet of 60-inch reinforced concrete steel-cylinder pipe from the south gatehouse to the pumping station on the east shore and installing in the existing connections to the pumping station specially designed valves to permit the existing pumps to take their suction from the water supply mains of which the new pipe becomes a part, instead of from Spot Pond. The work also includes 4,150 feet of fencing in the vicinity of the pipe line, for sanitary protection of the reservoir. Bidders were allowed to submit proposals either for precast steel-cylinder reinforced concrete pressure pipe, or steel pipe with mortar lining, or steel pipe with spun bituminous enamel lining. The low bid was for the precast steel-cylinder reinforced concrete pipe.

The contractor commenced clearing along the pipe line and constructing the fence about September 5. In general, excavation was made for only one or two pipe lengths at a time with a 1½ cubic yard backhoe which, after digging a short length of trench, picked up and laid a section of pipe with a cable sling attached to the bucket. This method was used to advantage except in locations where extensive ledge was encountered. At these locations the material overlying the ledge was first excavated, the ledge then broken up by blasting, and the trench backfilled sufficiently to allow pipe laying to proceed in the same manner as above described.

The pipe for this contract was manufactured in Natick with equipment previously used to manufacture pipe for the Weston Aqueduct siphons under Contract 73, the location of the plant being adjacent to that used in the manufacture of the pipe for the new pressure aqueduct under Contract 85. The 60-inch pipes were delivered four at a time on one of the trailers used for delivering single sections of the 11-foot 6-inch pipe for the pressure aqueduct. The first pipe delivery was made October 10. Pipe laying commenced at the southerly end of the line and was continued from October 11 to the end of the year, at which time 298 sections of the pipe, or a total length of 3,520 feet, were laid. Before the spigot end of the pipe being laid was inserted in the bell end of the last pipe placed, a fiber-filled lead gasket was set in this bell and hammered into position. After the pipe was laid, the joints were given a preliminary caulking from the inside and joint crevices on the outside were filled with mortar. No final caulking was done before the end of the year. The average number of sections placed per day was 8, and the maximum in any one day was 27. Refill closely followed the pipe laying.

The value of work included in contract estimates to November 4, the date of the latest estimate, was $28,331.86, of which 90 per cent has been approved for payment. The contractor's force averaged 14 men, the maximum being 21 for the week ending December 2, 1939, working one 8-hour shift.

The principal items of plant were as follows:

1 1½-cubic yard backhoe
1 ¾-cubic yard power shovel
1 40-horsepower bulldozer
Miscellaneous pumps, compressors, trucks, etc.

The total work done and materials furnished to date under the principal items of Contract 83 are as follows:

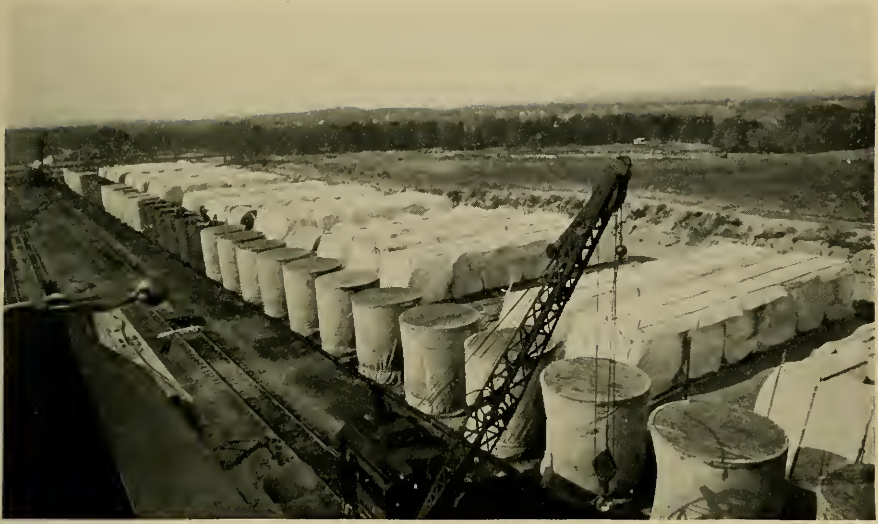
Stripping	1,140	cu. yds.
Earth excavation and refill	6,300	“ “
Rock excavation	1,970	“ “
Furnishing and laying 60-inch precast concrete pipe	3,160	“ “
Miscellaneous concrete	190	“ “
Portland cement	420	barrels
Reinforcing steel	2,530	pounds
Crushed stone and screened gravel	350	cu. yds.
Permanent fencing	3,890	lin. ft.

Steel-Cylinder Reinforced Concrete Pipe.—In addition to valves, pumps, hoists and other miscellaneous items purchased under PWA equipment contracts, the Commission also purchased all the pipe for the main line of the new pressure aqueduct under a PWA equipment contract. It involved the erection of a complete new plant in Natick and the work of inspection of materials and workmanship was under the supervision of the headquarters office but required a large assignment of personnel from the Wayland-Weston Division. This equipment contract was of exceptional size, larger than any of the Commission's past or present construction contracts with the exception of Contract 20 for the Coldbrook-Swift section of Quabbin Aqueduct Tunnel, and is described in detail as follows:

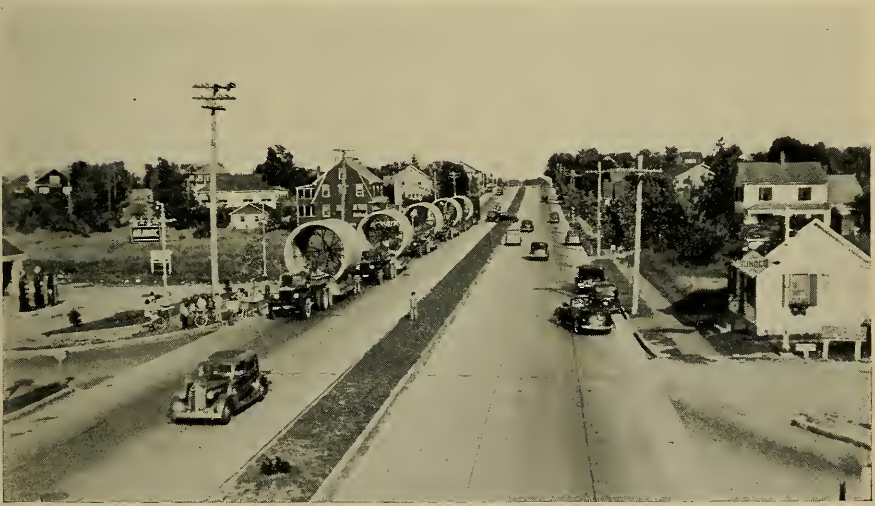
Contract 85.—Bids were opened December 19, 1938, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston. This is a PWA contract. Four bids were received, ranging from $4,164,126.50 to $4,553,363.00. They were from contractors in New Jersey, New York, Ohio and California. The contract was executed December 28, 1938, with the Lock Joint Pipe Company, Ampere, New Jersey, the lowest bidder. It required furnishing about 9,600 feet of precast steel-cylinder reinforced concrete pressure pipe 12-foot 6-inch inside diameter, about 67,500 feet of 11-foot 6-inch inside diameter, and about 2,200 feet of 7-foot inside diameter, and delivering this pipe alongside the pressure aqueduct line, each section of pipe substantially opposite its final position in the line.

The contractor selected a site for his main manufacturing plant on Speen Street, Natick, just north of the Boston-Worcester Turnpike. Here the 12-foot 6-inch and 11-foot 6-inch steel cylinders and reinforcing were fabricated, and the 11-foot 6-inch pipe was cast. The 12-foot 6-inch pipe was cast at another site in Southborough, sufficiently close to the required point of delivery so that it would not be necessary to use the public highways for the delivery of this huge pipe. The 7-foot pipe was fabricated and cast at a plant adjacent to the main plant at Natick which the contractor had previously used to manufacture pipe for the contractor building the Weston Aqueduct siphon pipes under Contract 73. Plant erection started January 12 and required a little over three months. This work consisted of grading the site, rolling and fabricating inner and outer steel forms for casting the pipe, placing the base rings in concrete, laying water and steam lines and standard-gage spur railroad tracks, assembling the concrete plant, erecting the ring shop and the steel plant. This steel plant was a steel building 300 x 70 feet, under which the cylinders were welded, rolled and the reinforcing fabricated. During this time a plant was also erected by the contractor to crush, screen and wash gravel and sand for the concrete in the pipes. This plant was located in Framingham about two miles from the casting site and has a capacity of about 1,000 cubic yards of aggregate in 8 hours.

Each section of pipe consists of a steel cylinder with reinforced concrete on the outside and a plain concrete lining on the inside. The cylinder has a bell ring welded to one and a spigot ring to the other. These rings slide into each other with only 1/32-inch permitted clearance and when caulked with a continuous lead gasket form a water-tight joint. The rings were received flat and were rolled, butt welded and expanded to the exact diameter. Flat plates were butt welded together in an automatic welding machine and rolled to form the cylinder. The closure seam then was hand welded and the bell and spigot rings were hand welded on either end. The completed cylinder was then tested hydraulically for strength and water-tightness at a pressure sufficient to produce a stress of 23,000 pounds per square inch in the steel cylinder. The tested cylinder was then placed horizontally on a mandril which rotated and helically wound the reinforcing of round rods around the cylinders in two cages, one circular and one elliptical, the latter, with short axis vertical in final position, being required for the support of the dead weight of the pipe itself and of the trench backfill. The ends of the reinforcing were welded to the cylinder and longitudinal bars were tack welded to the cages holding them rigid. The reinforced cylinders with cages attached were then hauled to the casting site and placed vertically on the base rings which were formed to fit the bell end of the pipe. At the Natick plant steam cranes placed the inner and outer forms on the base rings and the pipes were ready for concrete. A tamping top placed on the upper ends of the forms held them and the steel cylinder in position during concreting. As the work progressed concrete tests indicated it safe to reduce the cement content and the cement was gradually reduced from 2.00 to 1.65 barrels per cubic yard but was increased again to 1.75 during colder weather. The water-cement ratio averaged about 5.5 gallons to the sack. Test strengths in excess of 5,000 pounds per square inch at 28 days were usually obtained.



Contract 85.—Manufacture of Precast Pipe for Pressure Aqueduct. Canvas Covers for Steam Curing in the Casting Line and for Frost Protection in the Water Curing and Storage Yard.



Contract 85.—Delivering the 46-ton Sections of Precast Pipe.

At Natick the concrete was mixed with two 2-cubic yard mixers. Cement was received in bulk cars of the bottom-dump type and unloaded by a mechanical screw to a bucket conveyor and thence to a hopper above the mixers. The aggregates were trucked to the work and dumped into a hopper under the roadway. From here they were conveyed by a bucket elevator to bins above the mixers. The aggregates and cement were proportioned by weight in an aggremeter which fed either mixer. The water was measured by an electrically-controlled valve. The concrete was mixed at least two minutes and then poured into two bottom-dump buckets with a capacity of 2 cubic yards each. These buckets were on flat cars which were hauled by a dinkey locomotive to the casting site. There the buckets were lifted off by the locomotive crane and the concrete deposited into a continuously rotating hopper placed on the tamping platform above the vertical forms. The concrete was compacted by external electric vibrators placed on the outer forms. To provide for vertical and horizontal bends in the pipe line, the spigot ring was welded at a bevel, maximum 4½ degrees, and the tamping top equipped to hold the spigot to a true circle in the inclined plane.

At Natick after the concrete was poured it was steamed until the next day when the forms were removed. The pipes were then covered with canvas and steamed two more days. On the third day, steel struts were placed inside the pipes to prevent sagging during moving and the pipes were lifted off the base rings by a gantry crane which straddled them. This crane then turned the pipes on their sides and they were rolled into the curing yard. There the pipes were cured 12 days more by keeping them moist inside and out. In the warmer weather this was done by a system of sprinklers installed on the top and inside the pipes. In the colder weather it was necessary to completely cover the pipes and bleed steam inside the enclosures, when the air temperature was below 45 degrees, creating a warm fog around the pipes. This required over 1,000 pieces of canvas 18 feet square. At the end of this 12-day period, the concrete in the pipes was considered cured. They were then rolled onto Diesel-drawn trailers and hauled to the laying contractors. At the point of delivery the pipe was rolled from the trailer on skids and kept under control by cable around the pipe snubbed on front of trailer.

At Southborough, the pipes were cast vertically in a manner similar to that used in Natick. The concreting, however, was done with a portable unit, 1-cubic yard capacity. The pipes were not cured by steam as at Natick since curing was done in a vertical position for 14 days. Each pipe was kept wet for that period by sprinkling except in the colder weather when curing was effected by bleeding steam under covers placed over the tops of the vertical units.

The 12-foot 6-inch diameter pipe was cast in lengths of 12 feet which were all designed for 100 feet hydrostatic head. Each length contained about 20 cubic yards of concrete and weighed about 46 tons. The 11-foot 6-inch diameter pipe was cast in lengths of 16 feet and designed for hydrostatic heads varying from 100 feet to 220 feet, the difference in strength being obtained by varying the thickness of the steel cylinder and also the size and spacing of the reinforcing. The weight of each section of pipe varied from 45 to 50 tons and each section contained about 20 cubic yards of concrete. The 7-foot diameter pipe was cast in lengths of 12 feet each, weighing about 16 tons and containing about 7 cubic yards of concrete. It was also designed for hydrostatic heads varying from 100 feet to 220 feet.

Grading of the Southborough site for casting the 12-foot 6-inch pipe was started March 16. Casting commenced May 1 and continued at the rate of five units a day until completion on November 14. 90.4 per cent of all pipe required of this size was completed and delivered at the end of the year. The first 11-foot 6-inch pipe was cast at the Natick plant April 17. It required a few weeks for the manufacturing operation to be smoothed out and then 24 pipes were cast each day. 97.1 per cent of the total pipe required was cast at the end of the year. Delivery of these pipes to the laying contractors was started May 16 and 89.3 per cent of the total pipe required was delivered at the end of the year. Casting of the 7-foot pipe commenced June 16 and continued at the rate of 8 units a day until completion August 8, and all units were delivered to the laying contractors at the end of the year. The manufacture of all the pipe was nearly complete and considerably in advance of scheduled requirements.

The value of work included in contract estimates to November 24 the date of the latest estimate, was $3,547,720.70, of which 90 per cent has been approved for payment. The contractor's force averaged 324 men, the maximum being 504 for the week ending July 1.

The principal items of plant were as follows:

For the Ring Shop

1	12-inch slip rolls
1	Bevel forming machine
2	200-400 amp. arc welding machine

For the 138 and 150-inch Steel Shop

1	135-inch power shears
4	Welding tables
29	150-400 amp. arc welding machines
2	1000-2000 automatic arc welding machines
1	16-foot slip rolls
2	Winding mandrils

For the Natick Casting Yard

	Concreting plant
74	Base rings
25	Sets of forms and tamping tops
1	50-ton gantry crane
3	Steam cranes, 50-foot boom
5	Locomotives, 2 steam and 3 gas
3	2-cu. yd. rotating hoppers
5	70-ton tractors with 50-ton trailers
2	400-amp. arc welding machines
	Miscellaneous railroad equipment including nearly 5,000 feet of track.

Other miscellaneous equipment included nearly 4,800 steel struts for bracing inside the pipe, and over three miles of steam and sprinkler pipe and hose.

For the Southborough Casting Yard

	Concreting plant
1	Gasoline crane, 50-foot boom
5	Sets of forms and tamping tops
1	100-ton A-frame gantry
	Miscellaneous tractor equipment

Other miscellaneous equipment including 860 steel struts for bracing inside the pipe and 7,000 feet of steam and sprinkler pipe.

For the 84-inch Steel Shop and Casting Yard

	Concreting plant
1	12-foot slip rolls
1	Welding table
8	200-400 arc welding machines
1	Winding mandril
1	Gasoline crane, 50-foot boom
8	Sets of forms and tamping tops
	Miscellaneous tractor equipment

Maintenance of Records

Photographic Records.—The taking of moving pictures from time to time to illustrate the progress of the work was continued.

Cemetery Records.—Records of assignment of lots and interments in Quabbin Park Cemetery and of the general removal of bodies from existing cemeteries in the reservoir area were maintained.

Cost Records.—Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements. Time and cost records covering all operations under PWA grants were maintained.

Inventories.—Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

SOUTHBOROUGH-FRAMINGHAM DIVISION

The Southborough-Framingham Division continued in charge of the field work in connection with Sections 1, 2 and 3 of the pressure aqueduct and was in charge of the construction of this westerly half of the aqueduct. All work west of Sudbury Reservoir was done in cooperation with the Clinton office of the Water Division of the Metropolitan District Commission, E. R. B. Allardice, Superintendent. All work in the vicinity of Sudbury Reservoir and easterly was done in cooperation with the Framingham office of said division, Isreal P. Aubey, Superintendent.

Miscellaneous Office Work

Semi-monthly estimates for Contract 74 and monthly estimates for Contracts 75 and 77 were prepared. Topographic and real estate plans were prepared along the entire 4.9 miles of the cut-and-cover aqueduct line. Taking plans were prepared covering about 99 acres along these sections, 1 and 3, and for those shaft heads and that portion of the tunnel, Section 2 under Sudbury Reservoir, which were required to be taken outside the lands of the Commonwealth. Data on the titles, assessed valuation, etc., of all property taken were furnished by the headquarters office. Additional topographic details were plotted in the vicinity of culverts, blow-offs and road crossings.

Miscellaneous Field Work

Lines and grades were given for Contracts 74, 75, 77 and 100. Surveys were made for the aqueduct line and all appurtenant structures. The center line of the cut-and-cover aqueduct was taped a distance of about 4.9 miles, and the surface profile taken. Rod soundings and test pits were continued until March 31 with a labor force which averaged about 6 men.

Prior to May 23, photographs of real estate and construction work along the entire pressure aqueduct line were taken by personnel from the Quabbin Reservoir and Aqueduct Division, and after that date by the personnel of this division. During the year, 1,296 photographs were taken by this division. Miscellaneous tests of aggregates for concrete were made and concrete cylinders prepared and sent for testing to the Commission's laboratory in the Wayland-Weston Division. Samples of rock were collected from the tunnel excavations and geological studies continued throughout the year.

Progress of Contracts

Contract 74.—Bids were opened December 15, 1938, for Contract 74, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct in the Town of Southborough. This is a PWA contract. Eight bids were received, ranging from $3,197,015.00 to $4,905,310.00. Three were from contractors in New York and one each from contractors in Massachusetts, Pennsylvania, Illionois, Minnesota and California. The contract was executed December 30, 1938, with West Construction Company, Boston, Mass., the lowest bidder. The work consisted of sinking and lining with concrete four shafts varying in depth from 160 feet to 237 feet, and driving from these shafts and lining with concrete about 15,880 feet of hard rock tunnel.

The work was begun January 20 with the clearing of the site in the vicinity of Shaft 2. At Shaft 1, which was the most inaccessible of the four locations, clearing was started February 24, and the shaft working area completely cleared March 11. Access to the shaft consisted of a 20-foot right-of-way about 3,000 feet long. Clearing at the other shafts was completed February 13. Typical contractor's buildings at each shaft head were a dry house, compressor house, blacksmith shop, contractor's office and engineer's office. The main powder magazine was built in an isolated location in the vicinity of Shaft 3 on the shore of Sudbury Reservoir, remote from residential areas.

Electrical power for the contractor's operations was purchased from the Commission under an arrangement which required him to repair and replace certain equipment at the Sudbury Dam power station and to furnish electricity and subsequently remove the power lines and other equipment. The total electric energy used during the year was 2,043,400 kilowatt hours.

In order to protect the existing water supply in the immediate vicinity, all toilet fixtures in the contractor's buildings were connected at Shafts 3 and 4 to 10,000-gallon tanks, from which the sewage was trucked daily to a manhole in the Marlborough sewerage system, and at Shafts 1 and 2 they were connected to septic tanks. As a further protection of the District's water supply the entire area of construction operations was fenced at each shaft. All drainage from the tunnel spoil banks and the contractor's operations was collected in a settling basin at each shaft, from which the effluent was chlorinated. The tunnel excavations were exceptionally dry.

The entire construction work was remarkably free from serious accidents and there were no fatalities.

The method used in sinking and lining each of the shafts was the same. In earth the excavation was done by hand, the material being hoisted from the shaft in buckets by a stiff-leg derrick. The excavation was supported by timbering. In rock the drilling was done with jack hammers, the holes loaded with 40 per cent dynamite and blasted. The muck was excavated by hand and removed in the same manner as the overburden. Concrete shaft lining was started when the excavation had reached a depth in rock of 40 to 45 feet. From 6 to 8 sets of forms 5 feet high were poured at once. At Shafts 2 and 3 transit mixed concrete was used. The average weekly progress of shaft sinking and lining varied from 17.3 feet, at Shaft 1, to 17.8 feet, at Shaft 2, except that at the larger Shaft 4 where provision is made in the finished construction for both a dry and a wet well, the average progress was only 12.9 feet. Sinking of all shafts to the bottom of the sump was completed June 10. Shafts 3 and 4 were grouted to reduce the flow of water. At Shafts 1 and 2 this was sufficiently taken care of by plugging the grout pipes pending grouting at a later date.

The tunnel headings were turned and excavation carried for a short distance by the heading and bench method, drilling by jack hammers and excavating the muck by hand. Then progress was suspended and equipment for tunnel excavation erected. This included a head frame over each shaft, single counter-weighted cage, narrow-gage tracks in the tunnel and on the spoil banks, drill jumbos and mucking machines placed in the tunnel, also air, water and electric lines and ventilating systems. Excavation was then resumed by the full-face method. The jumbo mounted five automatic drifting drills. An average of 37 holes 10 to 12 feet deep in the heading were loaded with 40 per cent dynamite. Muck cars of 4 to 5 cubic yards capacity were loaded by the mucking machine, hauled onto the cage, hoisted to the shaft head and emptied into a rock hopper from which the muck was carried in trucks to the spoil area. In the double headings from Shafts 2 and 3 the alternation of operations from one heading to the other, by drilling and blasting one heading while mucking the other, enabled faster progress per heading to be made than at Shafts 1 and 4.

Tunnel excavation progressed as follows after cage installation: At Shaft 1 it started July 14 and was extended 1,862 feet from the shaft at the end of the year. At Shaft 2 full-face excavation of the west heading started June 16 and was extended 2,956 feet from the shaft at the end of the year. The east heading started June 30 and was extended 2,573 feet from the shaft to the point of holing through. This occurred November 23. At Shaft 3 full-face excavation of the west heading started June 5 and was extended 2,979 feet to the point of holing through. The east heading started June 20 and was extended 2,840 feet from the shaft to the point of holing through November 17. At Shaft 4 the full-face excavation was started July 3 and extended 2,060 feet to the point of holing through.

The tunnel excavation required support for a length of only 691 feet or 4 1/3 per cent of the total 3 miles between Shafts 1 and 4. The contractor purchased sand and stone for tunnel concrete from pits in North Grafton, Worcester, Natick and Ashland, and on November 7 started hauling the same to stock piles at Shafts 2 and 3. He started work on the erection of aggregate and cement hoppers October 9. At the end of the year the concreting plant at Shaft 2 was 40 per cent complete; at Shaft 3, 80 per cent.

The value of work included in contract estimates to November 29, the date of the latest estimate, was $1,713,418.00, of which 90 per cent has been approved for payment December 7, 1939. The contractor's force averaged 313 men during the year.

The principal items of plant equipment for tunnel driving consisted of the following at each shaft: A main 5-ton hoist, air compressors of about 1,200 cubic feet per minute capacity, drill sharpening equipment, pumps, transformers, trucks, etc., with a drill jumbo and mucking machine in each heading, electric locomotives, muck cars, trucks, etc.

The total work done and materials furnished to date under the principal items of Contract 74 are as follows:

Earth excavation in shafts	730	cu. yds.
Rock excavation in shafts	10,000	“ “
Excavation in tunnel, except within 50 feet of shaft center lines	135,760	“ “
Pumping from shafts and tunnel	15,250	million ft. gals.
Drainage channels for shafts and tunnel	10,490	lin. ft.
Concrete masonry in shafts	1,970	cu. yds.
Materials for concrete masonry in tunnel	29,490	“ “
Structural steel support in shafts and tunnel	209,150	lbs.
Mixing and placing grout	50	cu. yds.
Portland cement	3,450	bbls.
Steel for reinforcing concrete	16,100	lbs.
Refilling and embanking	21,290	cu. yds.
Miscellaneous cast iron, wrought iron and steel	6,500	lbs.
Fences for sanitary protection of watersheds	8,200	lin. ft.

Contract 75.—Bids were opened February 16, for constructing Section 1 of the cut-and-cover pressure aqueduct in the towns of Marlborough and Southborough. This is a PWA contract. Seven bids were received, ranging from $503,871.38 to $753,836.44. The contract was executed March 13 with B. A. Gardetto, Inc., Boston, Massachusetts, the lowest bidder. The work consists of raising the embankments surrounding the upper end of the open channel just below the Wachusett Aqueduct terminal chamber to divert all local drainage therefrom, constructing a masonry diverting dam and spillway across the open channel about 1,200 feet below the terminal chamber to create an intake or regulating basin between the Wachusett grade-line aqueduct and the new pressure aqueduct, and laying about 9,600 feet of precast steel-cylinder concrete pipe 12 feet 6 inches in diameter, furnished and delivered by the Commission, to connect this intake with the downtake shaft of the Southborough Tunnel.

The contractor commenced clearing along the aqueduct line March 15 and continued clearing, grubbing and stripping until October 23. The work followed closely the District's open channel into Sudbury Reservoir, and to protect the existing water supply the contractor constructed 5,800 feet of fence and installed chlorinators at various points along the line of his work. Excavation for the diversion of local Crane Brook drainage was commenced April 17 and suspended May 27. Construction of roads and storage areas for the delivery of the pipe was started April 22. At the same time excavation for the aqueduct line was started at the east end near the tunnel shaft, and was about 90 per cent complete at the end of the year. The 12-foot 6-inch diameter pipe units were 12 feet long and weighed approximately 46 tons each. Sections used for vertical and horizontal bends averaged slightly shorter on account of their beveled ends. Delivery of the pipe commenced May 24 and at the end of the year 731 units, or 8,772 feet, were delivered. Where the trench was through ledge a concrete base was first poured. In earth the pipe was laid directly on the bottom of the excavation except that a screened-gravel base was placed in some wet places and tile drains in addition were required in others for underdrainage.

Pipe laying commenced June 18 about 140 feet from the east end, or as near the operations of the tunnel contractor at Shaft 1 as was feasible, and continued westerly throughout the year. For placing the pipe a 50-ton steam powered railroad crane was operated on track laid on the bottom of the trench, this being possible on account of the fact that the entire length under this contract was at a uniform and nearly level grade. Ramps from the original surface to the bottom of the trench were constructed at right angles to the trench at various points as the laying progressed. The section of pipe to be placed was let down the ramp by a single cable running from the hoist drum of a tractor around the pipe and back to the tractor. After the pipe was lowered to the track the cable from the crane was slung around it, the pipe was lifted and a small flat car pushed under it. The crane then moved the car and pipe up to position. Meanwhile the track and ties had been removed in the space where the pipe was to be set. The track was built in short sections which were handled by the locomotive crane. The crane lifted the pipe off the car which was pushed back against the crane, and the pipe was moved forward the short remaining distance and lowered and eased into position. Hydraulic jacks were used to bring the pipe entirely into place. At some points it was found expedient to leave a few ties under the pipe to help hold it to grade.

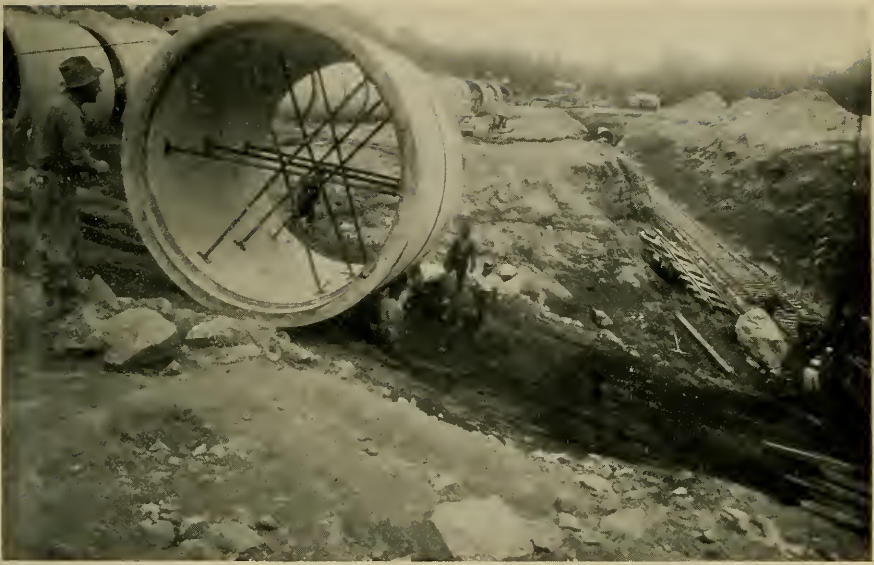
Before the spigot end of the pipe being placed was inserted into the bell end of the last pipe in place, a fiber-filled lead gasket was set in this bell end and hammered in place. After the pipe was set in place, the joints were given a preliminary caulking from the inside, and on the outside filled with mortar mixed in a small gasoline-powered mixer and placed in the joint by hand. The concrete cradle was then poured supporting approximately the lower third (120 degrees) of the pipe. Final caulking was delayed until after the backfill was placed. This caulking was done from July 25 to October 5 when it was about 30 per cent complete. Finishing the inside joints with mortar placed by guniting, and by hand, was started July 28 and on August 16 it was about 4 per cent complete.

Laying continued until the end of the year when 677 sections, or 8,119 feet, had been placed. The average number of sections placed, on each day on which pipe was actually placed, was 10. The maximum in any one day was 20. Refill over the aqueduct was started July 11 and at the end of the year approximately 7,000 linear feet had been backfilled.

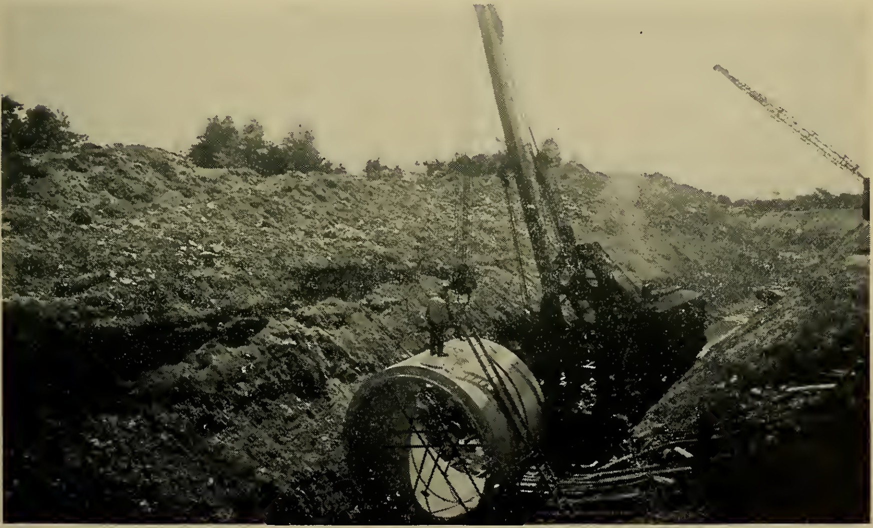
The contract included two road crossings, eight culverts, one pipe line to take care of local drainage, and one emergency overflow spillway consisting of two concrete collars to confine the wash of material across the top of the pipe line in case excessive floods exceed the capacity of surface gutters across the top of the pipe. Part of the concrete used in these special structures and in the pipe cradle, etc. was mixed at the site of the work and part was transit mixed, aggregates being obtained from borrow pits in Natick, Shrewsbury and Saxonville.

To construct the overflow dam across the open channel a sand-bag cofferdam was constructed across the channel just upstream and another just downstream, the latter consisting of filling the archway under the stone bridge just downstream from the site. The flow of water in the open channel was maintained in a diversion ditch constructed around the south end of the overflow dam site and the stone bridge. A ditch from the open channel above the upper sand-bag cofferdam to the lower end of the Crane Brook diversion ditch was excavated. Placing of concrete for the intake structure commenced September 23. Stone masonry was supplied from a quarry in West Townsend and was first placed in the work August 28. At the end of the year masonry in the dam abutments was completed except the cap stones, and masonry in the dam was about 90 per cent completed.

The value of work included in contract estimates to November 18, the date of the latest estimate, was $295,215.38, of which 90 per cent has been approved for payment. The contractor's force averaged 84 men. He worked three 8-hour shifts in making preparations for laying the pipe, and while laying the pipe worked one 8-hour shift or two 7-hour shifts, depending upon the available supply of pipe.



Contract 75.—Placing the Precast Pipe in the Pressure Aqueduct. Rolling 12-foot 6-inch Diameter Pipe Down the Ramp.



Contract 75.—Handling 12-foot 6-inch Diameter Pipe by Locomotive Crane in the Trench Bottom.

The principal items of plant were as follows:

1	50-ton railroad derrick car
7	Power shovels and excavators
2	Truck cranes
6	Bulldozers
3	12-cubic yard tractor wagons
1	2-unit Sheep's-foot roller
	Miscellaneous pumps, air compressors, concrete mixers, trucks, etc.

The total work done and materials furnished to date under the principal items of Contract 75 are shown in an accompanying table.

Contract 77.—Bids were opened April 18, for constructing Section 3 of the cut-and-cover pressure aqueduct in the towns of Southborough and Framingham. This is a PWA contract. Six bids were received, ranging from $497,382.48 to $620,552.73. The contract was executed May 3 with B. A. Gardetto, Inc., Boston, Mass., the lowest bidder. The work consists of laying about 16,600 feet of precast steel-cylinder reinforced concrete pipe 11 feet 6 inches in diameter, furnished and delivered by the Commission, extending from the uptake shaft of the Southborough Tunnel just below Sudbury Dam to a point east of Edgell Road in Framingham, and constructing appurtenant works to provide connections at the top of the uptake shaft for the regulation at this point of the flow in the new pressure aqueduct, and to provide emergency connections with Sudbury Reservoir and with the intake to Weston Aqueduct.

The contractor commenced clearing along the aqueduct line May 3 and continued clearing, grubbing and stripping until the end of the year. A portion of the work was along the shore of the District's Framingham Reservoir No. 3, and to protect the existing water supply the contractor's operations were fenced and tributaries of the reservoir chlorinated. Construction of roads and storage areas for the delivery of pipe was started May 22 and excavation for the aqueduct line was started at the east end May 29. The 11-foot 6-inch diameter pipe units were 16 feet long and the weights varied from 40 to 50 tons each. Delivery of the pipe commenced June 6 and at the end of the year 990 units, or 15,840 feet, of the 11-foot 6-inch pipe, and 6 units, or 72 feet, of smaller 7-foot diameter pipe for the emergency cross connection to Weston Aqueduct, were delivered. The method of preparing foundations and cradling the pipe, etc., was the same as previously described for Contract 75.

Pipe laying commenced August 11 at the extreme east end and continued westerly throughout the year. The pipe was placed by a gantry crane or traveling stiff-legged derrick of 52 tons capacity carried on a bridge having a span of 54 feet. This rides on rails placed on berms at the top of the slope. When the gantry was in position to place a section of pipe, the pipe was moved within reach of the gantry by rolling with a bulldozer. A sling was then attached and the pipe which was lifted by the gantry was swung over and lowered into the trench and eased into final position. When placing the pipe uphill, the gantry was anchored by bulldozers and other equipment attached to it by cables. When placing the pipe downhill, the gantry was anchored in the same manner and the pipe was anchored through the existing pipe line. In this way grades as steep as about 15 per cent were negotiated by the gantry, the actual grade of the pipe itself having a maximum steepness of about 30 per cent. The gantry was worked in a retreating position, straddling the open trench and with the boom reaching backward.

Fiber-filled lead gaskets were set in all the pipes as they were placed in a manner similar to that previously described for Contract 75. Preliminary caulking was started August 21, and final caulking was started November 24. Mortar filling of inside joints was completed in only three joints at the end of the year. Mortar filling of the outside joints and concrete cradling was done in the same manner as previously described for Contract 75. These operations started August 24 and continued throughout the year.

Laying continued until the end of the year when 860 sections, or 13,760 feet, had been placed. The average number of sections placed on each day during actual placing was 11. The maximum in any one day was 31, on September 12. Refill over the aqueduct was started August 27 and at the end of the year approximately 85 per cent of the line was covered, but not graded. The work involved the construction of five highway crossings and one railroad crossing under the Old Colony Branch of the New York, New Haven and Hartford Railroad. For the latter, the railroad erected a temporary bridge on piles driven outside the limits of the pipe line. Pile driving started July 12 and the tracks were relaid over the temporary bridge July 30. A concrete envelope was constructed around the pipe and completed September 20. The track was restored in its original position October 19. The railroad crew averaged 15 men for 51 working days, the maximum force being 82 men. The contractor's work also included the construction of 10 culverts to provide local drainage underneath the pipe line and 6 special overflow sections, similar to those previously described for Contract 75.

The value of work included in contract estimates to November 27, the date of the latest estimate, was $255,682.03, of which 90 per cent has been approved for payment December 7, 1939. The contractor's force averaged 92 men from the commencement of work, the maximum being 156 for the week ending October 21. In general the contractor worked two 6½-hour shifts in the summer and one 8-hour shift in the fall on pipe laying, two 8-hour shifts on excavation and one 8-hour shift on other miscellaneous operations.

The principal items of plant were as follows:

1 Gantry crane
5 Power shovels
1 40-ton crane (also used on Contract 75)
3 Dragline excavators
6 Caterpillar-tractor bulldozers
1 Scraper wagon
Miscellaneous pumps, air compressors, trucks, concrete mixer, etc.

The total work done and materials furnished to date under the principal items of Contract 77 are shown in an accompanying table.

Contract 100.—Bids were opened October 19, for constructing mortar lining in the Wachusett Aqueduct at its crossing of the Assabet River in the Town of Northborough. This is a PWA contract. Three bids were received, ranging from $5,805.80 to $7,870.31. The contract was executed October 27 with the National Gunite Contracting Company, Boston, Mass., the lowest bidder. The work consists of cleaning and preparing the surface and waterproofing with mortar lining a length of about 500 feet of the aqueduct at the Assabet River bridge.

The contractor commenced assembling his equipment October 20, and on October 22 the flow from Wachusett Dam was shut off and the aqueduct unwatered by a sand-bag cofferdam just below the bridge which was necessary on account of backwater from the cofferdam across the open channel constructed under Contract 75. For access for equipment, men, and materials, the contractor used a manhole at the east end of the bridge. The brick lining was cleaned October 23 and 24 and air, water and sand blast was found to give the best results in removing the thin coating of scum consisting largely of crenothrix. Placing of wire mesh on the roof was completed October 26. Guniting operations were started at 2:45 P.M., October 24, and completed at 4 A.M., October 29. The invert and sidewalls up to about the springing line were first gunited and allowed to set before the upper sidewalls and arch were done. A crack which existed along the sidewalls near the roof was cleaned out and filled with mortar before the lining was placed. At each end a course of brick work was removed from the sidewalls and invert and the mortar lining was brought into these openings against the sheet lead interlining to form a waterstop. A mixture of 1 part cement to 3 parts sand was used for the mortar lining. After the entire area was chlorinated the aqueduct was returned to service November 1.

The value of work included in contract estimates to November 27, the date of the latest estimate, was $4,900.00, of which 90 per cent has been approved for payment December 7, 1939. Operations were carried on with three 8-hour shifts. The contractor's force averaged 22 men, the maximum being 77 on October 27.

The principal items of plants were as follows:

4 Portable compressors
1 3½ cubic-foot concrete mixer
2 Cement guns

The total work done and materials furnished to date under the principal items of Contract 100 are as follows:

Preparation of aqueduct surfaces	2,000 sq. yds.
Mortar lining	2,000 " "
Portland cement	200 bbls.

WAYLAND-WESTON DIVISION

The Wayland-Weston Division continued in charge of the field work and construction of Sections 4, 5 and 6, the easterly half of the pressure aqueduct, including the Norumbega high-level distribution reservoir and also the additional pipe lines in the Weston Aqueduct siphons. All work was done in cooperation with the Framingham office of the Water Division of the Metropolitan District Commission, Isreal P. Aubey, Superintendent.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 80 and 81, monthly estimates for Contracts 73, 76, 78 and 79, and the final estimate for Contract 76 were prepared. Topographic, real estate and taking plans were prepared on the easterly section of the aqueduct and also for Sections 2 and 3 prior to the taking over of this work by the Southborough-Framingham Division. Data on the titles, assessed valuation, etc., of all property taken were furnished by the headquarters office. Additional topographic details were plotted in the vicinity of culverts, blow-offs and connections to the existing Weston Aqueduct supply mains, and for the dam sites and other details for the Norumbega Reservoir.

Miscellaneous Field Work

Lines and grades were given for Contracts 73, 76, 78, 79, 80 and 81. Surveys were made for the aqueduct line and all appurtenant structures. The center line was taped and surface profile taken. Rod soundings were completed May 13 on the aqueduct line and also at the sites of the embankments of Norumbega Reservoir with a labor force which averaged about 9 men. Surveys and profiles were made along the line of the Weston Aqueduct siphons. A labor force of 13 men were five days removing nursery stock from the pressure aqueduct taking through the property of the Weston Nurseries. Surveys were made for a geologic profile along the aqueduct line.

Testing Laboratories

Concrete Laboratory.—A concrete laboratory was established at the Speen Street site of the contractor's plant for the manufacture of pipe under Contract 85. Tests were made here on materials used in connection with many contracts under this and other divisions, the Speen Street location being selected because of the large amount of work required to be done in connection with the manufacture of the steel-cylinder concrete pipe. The laboratory was equipped with a moist room for the curing of concrete test cylinders and a compression machine for crushing them. Equipment for aggregate screening, etc., was moved from the laboratory in the reservoir division. Tests were made to determine the suitability of soil for loaming. Proposed concrete aggregates were examined in advance of the work to determine their suitability and routine control tests for color, grading and moisture were made daily or weekly as required. Tests for weight, voids and absorbed moisture were made as required for the computation of the mixes and control of the water-cement ratio. Compression test cylinders were cast, capped and tested in accordance with PWA requirements and the job conditions. Miscellaneous work included briquette tests of mortar made with disintegrated feldspar, comparative compression tests to determine the effect of steam curing and of water curing on the quality of concrete, and tests of the relation between cement factor and resulting abrasive resistance of concrete. The work included tests on absorption and strength of brick. Tests of slab zinc and of the weight and uniformity of zinc coating for fence galvanizing were made in cooperation with the Quabbin laboratory.

Soil Testing Laboratory.—A laboratory equipped for soil testing was installed in the division office in Natick, using equipment moved from the Quabbin laboratory as this became available upon the completion of the Winsor Dam embankment. Samples of proposed pervious and impervious materials were tested to determine their suitability for use in the embankments for Norumbega Reservoir under Contract 80. Routine control tests were made during construction covering sizing, permeability, porosity, plasticity, moisture content and consolidation determinations. Samples of soils to be used in the enlargement of the Fells Reservoir were tested for suitability.

Progress of Contracts

Contract 73.—Contract 73, a PWA contract, with Leo Butler Comapny, for constructing inverted pipe siphons on the Weston Aqueduct at Sudbury River and Happy Hollow in the towns of Framingham and Wayland, was continued and practically completed except for some grading, seeding and cleaning up.

Preparation of the site for the manufacture of the 102-inch diameter steel-cylinder reinforced concrete pipe began the last week in January. The joint rings were shipped to the job ready for use. The construction of the steel assembly for the pipe involved assembling and welding the plates, curving and making the final weld for the cylinder, welding the joint rings to the cylinder, winding one circular and one elliptical reinforcing cage for each cylinder, and assembling cylinders and cages. The cylinders were tested for strength and water-tightness, under hydrostatic pressure to produce a stress of 24,000 pounds per square inch in the steel. The thickness of steel used in the cylinders was 12-gage for the Sudbury River siphon and 14-gage for the Happy Hollow siphon.

Casting commenced March 17 and, with the exception of some delays during the first week, continued at the rate of eight 12-foot lengths of pipe per day until the last concrete was poured May 27. Twenty-four cast-iron base rings were provided for the vertical casting forms, which were steel, the outer shell being expandable and the inner collapsible. After casting, moist steam was let into the center of the form, and 24 hours later the forms were removed, cleaned and set on another base ring for casting another length. A canvas hood was placed over the stripped pipe and steam curing continued for two days, after which the pipe was removed from the base ring and placed by a crane in a vertical position in the curing yard where it was cured under water spray for 12 days. Following the curing period the pipes were tipped to horizontal position and stored until removed for delivery. A 125-horsepower coal-fired boiler supplied the necessary steam. Concrete was mixed and placed with a 1-cubic yard paver equipped with a hoisting tower. Aggregates were secured from a local gravel pit. 2.05 barrels of cement per cubic yard and 4.4 gallons of water per sack were used. Test strengths of 5,000 pounds per square inch at 28 days were usually obtained. The concrete was consolidated and a smooth surface secured by two motor-driven vibrators fastened to the outer form, and by spading from the top. Each length of pipe contained 8.3 cubic yards of concrete and weighed, when completed, about 18 tons. The pipe was transported to the siphons by two 15-ton low-bed trailers pulled by truck tractors.

At the point of delivery the pipe was rolled from the trailer on skids and it was kept under control during the unloading by a cable around the pipe snubbed on the trailer.

Clearing of the site of the siphons began March 17 at Happy Hollow. Pipe trench excavation was started April 15 and the pipe was laid from April 26 to June 12. It was necessary because of high ground water to install a well-point pumping system to keep the trench dry for a length of about 220 feet in the low portion of Happy Hollow siphon. The material at this point was very fine sand which flowed freely when wet and which required sheeting. Most of the pipe trench was excavated by the same 62-ton Diesel-powered crane with which the pipe was laid. The crane was equipped for excavating by the addition of a 2-cubic yard clamshell bucket. At the Sudbury River siphon, pipe was laid from June 12 to September 12. To cross the river, three steel sheet piling cofferdams were driven by a steam hammer held by a crane working on a pile trestle bridge across the river.

The inside joints of the pipe were caulked by hand. After the final caulking, which was not done until after the backfill had been completed, the mortar joints on the inside of the pipe were hand-trowelled into place. The outside joints were filled with mortar as pipe-laying advanced. Concrete was brought to the job in transit mixers, the aggregates being secured from local sources and the cement supplied by the Commsision from tested stocks. Mortar for the joints was mixed on the job in a ¼-cubic yard mixer.

The Happy Hollow siphon was tested for water-tightness August 24 and 25 and showed a leakage of 90.2 gallons per day, which was only 4 per cent of the permitted 100 gallons per inch of diameter per mile. The flow of the Weston Aqueduct was diverted into the new line on November 1.

The Sudbury River siphon was tested for water-tightness November 4 and 5 and showed a leakage of 3,269 gallons per day, which was only 44 per cent of that permissible. The flow of the Weston Aqueduct was diverted into this line on November 21.

The value of work included in contract estimates to November 8, the date of the latest estimate, was $256,153.02, of which 90 per cent has been approved for payment. The contractor's force at the siphons averaged 24 men, the maximum being 63 during the week ending July 15. The average force employed in the manufacture of the pipe was 46 men for a period of 18 weeks, the maximum being 64 men during four weeks ending April 22. The contractor worked one 8-hour shift from March 16 to April 19, and September 18 to November 23; two from April 20 to May 25, and July 10 to September 15; and three from May 26 to July 8.

The principal items of plant were as follows:

1 62-ton Diesel-powered speed crane and excavator
1 Bulldozer
Miscellaneous pumps, compressors, trucks and trailers.

The total work done and materials furnished to date under the principal items of Contract 73 are as follows:

Earth excavation	35,000	cu. yds.
Rock excavation	50	" "
Refill and embankment	28,310	" "
Soil dressing and grassing	3,600	" "
Crushed stone and screened gravel	380	" "
Pipe siphon	4,790	lin. ft.
Concrete envelope, manholes, etc.	800	cu. yds.
Reinforcing steel	24,770	lbs.
Miscellaneous steel and iron	18,300	lbs.
Wooden sheeting left in place	60	M.ft.B.M.

Contract 76.—Contract 76, with Sprague and Henwood, Inc., for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, was completed April 7. This is a PWA contract. From three to six drilling

rigs were used taking borings along the center line of the pressure aqueduct and at the sites of the dam embankments at Norumbega Reservoir.

The amount of the final estimate dated April 24, was $22,218.88, all of which has been paid.

Contracts 78 and 79.—Bids were opened March 9, for constructing Sections 4 and 5 of the cut-and-cover aqueduct in the towns of Framingham, Natick, Wayland and Weston. These are PWA contracts. Bidders were invited to submit proposals for either Contract 78, Section 4, or Contract 79, Section 5, separately (Proposal A), or for each contract contingent upon the award of both contracts to the same bidder (Proposal B). For Contract 78, nine bids were received under Proposal A and six under Proposal B, ranging from $524,480.95 to $697,769.87; and for Contract 79, five bids were received under Proposal A and six under Proposal B, ranging from $536,950.22 to $703,928.89. One of the bids was from a New York contractor, one from Delaware, two from California and all others from Massachusetts. The contracts were executed March 20 with the American Concrete and Steel Pipe Company of Los Angeles, California, the lowest bidder for both contracts under Proposal B. The work consists of laying about 17,800 linear feet on Section 4, and 18,000 linear feet on Section 5, of precast steel-cylinder reinforced concrete pipe 11 feet 6 inches in diameter, furnished and delivered by the Commission, extending from Edgell Road, Framingham to Winter Street in Weston.

The contractor commenced clearing along the aqueduct line March 27 at the west end, and this work was closely followed on both sections by the construction of roads and storage areas for the delivery of pipe. Excavation of the pipe trench was started at the east end of Section 5, May 15, using drag-line excavators. High ground water in that location necessitated pumping from well points installed on both sides of the trench for a length of about 1,400 feet. At the end of the year about 32,300 linear feet of pipe had been delivered alongside the trench. The method of preparing foundations and cradling the pipe, etc., was the same as previously described for Contracts 75 and 77. A number of swampy areas containing peat in depths up to 24 feet have been crossed on both Sections 4 and 5. Solid foundations have been secured in these areas by constructing dikes of stable material on either side of the location, removing the peat between, and refilling with stable material.

Pipe laying commenced May 24 at the east end of Section 5. The pipe was placed by a gantry crane or traveling stiff-legged derrick of over 50-ton capacity for a span of 48 feet, six feet less than the similar gantry used on Contract 77. The operation of placing the pipe sections was similar to that previously described for Contract 77, the gantry being worked in an advancing position and finally in a retreating position.

The Sudbury River was diverted to the east of its course and the pipe trench excavated across its bed. For laying the pipe in the river bottom a track of standard tee rails spiked to ties was laid in the trench bottom, and a ramp extending from high ground where pipe had been delivered down to trench bottom was excavated at a convenient point. The pipe sections were rolled down the ramp onto the track and were then slid along the rails to their position in the trench. This method of laying was also employed for the pipe on the east slope of the Sudbury River. For laying the pipe on the west slope, the track in the trench bottom was used but the gantry set the pipe sections onto the track, after which they were hauled into place with a tractor. Small steel channels were placed over the heads of the rails to prevent the concrete pipe from being damaged by the friction. Fiber-filled lead gaskets were placed in the joints as soon as the adjoining pipes were fitted together and preliminary caulking was done promptly before the lower portion of the outside joints was filled with mortar, the procedure for mortar-filling the outside joints and cradling the pipe in concrete being the same as previously described for Contract 75. Final caulking was done after the refill was placed and allowed to settle and at the end of the year was completed for 11,460 feet on Section 4 and 14,750 feet on Section 5. The mortaring of the inside joints was first done by guniting for 3,560 feet on Section 4 and 2,325 feet on

Section 5 but was later changed to hand placing, by which method approximately 800 additional feet of Section 5 were completed at the end of the year.

Pipe laying continued from the extreme east end westerly until July 15, when 325 sections, or 5,200 linear feet, had been placed, an average of nine per day. The gantry was then dismantled, removed to the extreme west end of Section 4 and reassembled. Pipe laying then continued easterly from July 20 to September 14, when an additional 712 sections, or 11,392 feet, were placed, an average of 15 per day. The gantry was again dismantled and moved back to Section 5. Previous to this time it had been operated in an advancing position, straddling the pipe line and requiring, in places where the pipe was laid in embankment, much elaborate grading for the support of the gantry rails. When set up on Section 5 in September, the gantry worked in a retreating position, requiring much less advance preparation.

Pipe laying continued westerly on Section 5 from September 18 to November 24, when the last pipe was placed on this section. An additional 802 sections, or about 12,832 feet, were placed, an average of nearly 17 per day. The gantry then moved into Section 4, and on November 30 an additional 62 sections, or about 957 feet, were placed. At the end of the year, 1,901 sections, or about 30,381 feet, were laid. The maximum in any one day was 33, on September 23, in two shifts of 6 2/3 hours. The maximum in one 8-hour shift was 29, on November 27.

During freezing weather, when no laying of pipe or depositing of concrete was permitted on frozen ground, salamanders under tarpaulins were used supplemented by steam piped to the trench. At the concrete batching plant the aggregates and water were heated by steam and concrete was received on the job at temperatures in excess of 70 degrees Fahrenheit. Water and sand for the outside mortar joints were heated at the site of the work and the finished joints were protected from freezing by insulating pads placed over them and held fast.

Refill was completed for 11,300 feet on Section 4 and refill, final grading and soil dressing were practically completed on 12,800 feet on Section 5. The work involved the construction of 11 highway crossings, also 20 culverts to provide local drainage underneath the pipe line, 2 blow-offs, and 3 special overflow sections similar to those previously described under Contract 75.

The value of work included in contract estimates on Contract 78 to November 21, the date of the latest estimate, was $274,189.70, of which 90 per cent has been approved for payment. The value of work included in contract estimates on Contract 79 to November 7, the date of the latest estimate, was $305,267.47, of which 90 per cent has been approved for payment. The contractor's force averaged 205 men, the maximum being 398 for the week ending November 4. Excavation was occasionally carried on with three 8-hour shifts, but generally operations were conducted in two shifts, varying from 6 2/3 hours to 8 hours each.

The principal items of plant were as follows:

1	Gantry crane
2	Power shovels
1	Truck crane
6	Dragline excavators
15	Caterpillar-tractor bulldozers
4	Scraper wagons
1	Sheep's-foot roller
1	Cement gun
	Miscellaneous air compressors, concrete mixers, etc.

The total work done and the materials furnished to date under the principal items of Contracts 78 and 79 are shown on an accompanying table.

Contract 80.—Bids were opened June 1, for constructing the Norumbega Reservoir in the Town of Weston for high-level distribution. This is a PWA contract. Six bids were received, ranging from $478,605.49 to $684,587.05. The contract was executed June 15 with Carlo Bianchi & Co., Inc., Framingham, Mass., the lowest bidder. The work consists of constructing five earth embankment dikes to form the main reservoir, maximum flow line elevation 274.5, and adjoining lower emergency reservoir, maximum flow line elevation 251.5, about

10 feet above Schencks Pond, also constructing that portion of the new pressure aqueduct which crosses the bottom of the main reservoir in a twin line. This double-barrel design makes any future major construction in the reservoir area unnecessary in the event that an additional parallel aqueduct line is needed. The portion of the aqueduct line required under this contract contains about 1,060 feet of this double-barrel line, also the laying of about 170 feet of the 11-foot 6-inch diameter precast steel-cylinder reinforced concrete pressure pipe furnished under Contract 85, these units being only 8 feet in length to reduce their weight and facilitate handling. The work also includes construction of a control gatehouse on the aqueduct line at the point where it leaves the main reservoir, and of access roads and other appurtenant works.

The contractor commenced clearing the site June 15. Drainage ditches were excavated for the purpose of draining several swamps which were within the reservoir area. These swamps contained peat to a maximum depth of 20 feet, the average depth being 6 feet. The peat was removed with shovels and draglines and hauled in dump trucks and caterpillar wagons to a designated spoil area west of the reservoir site. Core trenches were excavated to sound bedrock on the center lines of the dams and, where required, concrete mats were constructed on the surface of the ledge. Seams in the ledge beneath these mats were grouted. Embankment construction for the five dams was practically complete at the end of the year except for the gap at the aqueduct crossing and gatehouse site. All of the dams are constructed with rolled impervious cores in the center with outer sections of consolidated semi-impervious and pervious materials. Loam dressing was placed on the downstream slopes and riprap on the upstream slopes. The material for the impervious cores of topsoil and till was secured on the site and consolidated with sheep's-foot rollers and pneumatic tampers. Semi-impervious and pervious material sufficient for the construction of the dams was also secured from borrow pits at the site.

The excavation for the gatehouse and the twin line aqueduct across the reservoir basin is in progress, some of the spoil being disposed of as riprap on the slopes of the dams.

The value of work included in contract estimates to November 21, the date of the latest estimate, was $162,846.49, of which 90 per cent has been approved for payment. The contractor's force averaged 86 men, the maximum being 108 for the week ending July 15.

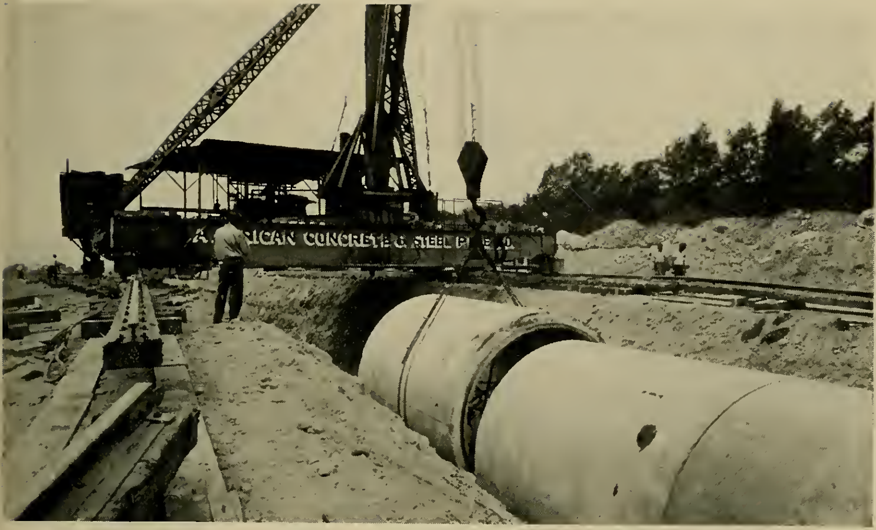
The principal items of plant were as follows:

8	Caterpillar tractor bulldozers
4	Gasoline shovels
1	Dragline excavator
4	Scraper wagons
2	Sheep's-foot rollers
	Miscellaneous air compressors, trucks, etc.

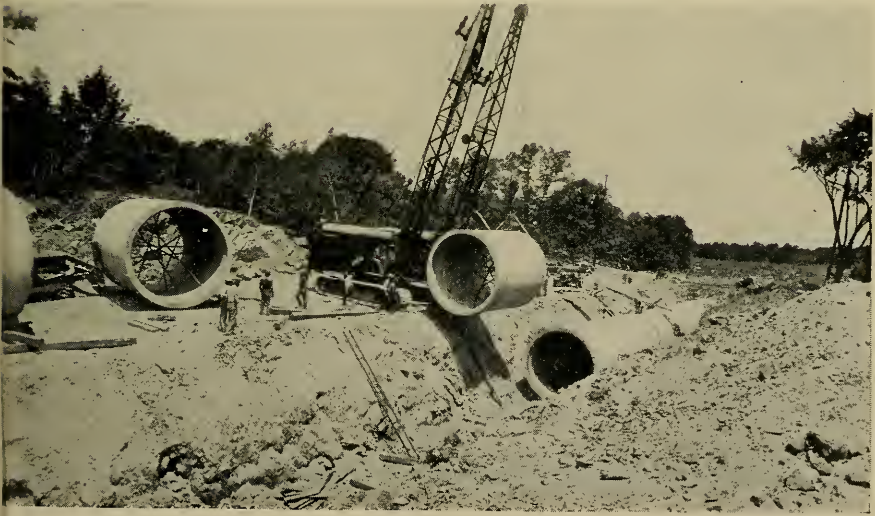
The total work done and materials furnished to date under the principal items of Contract 80 are as follows:

Stripping	53,900	cu. yds.
Earth excavation	177,900	" "
Rock excavation	13,500	" "
Consolidated pervious embankments	19,500	" "
Rolled semi-impervious embankments	42,800	" "
Rolled impervious embankments	28,800	" "
Miscellaneous concrete	1,240	" "
Portland cement	2,100	bbls.

Contract 81.—Bids were opened April 13, for constructing the cut-and-cover aqueduct, Section 6 of the pressure aqueduct, in the Town of Weston. This is a PWA contract. Six bids were received, ranging from $560,432.25 to $687,967.00. The contract was executed April 26 with M. F. Gaddis, Inc., of Boston, Mass., the lowest bidder. The work consists of laying about 4,920 feet of precast steel-cylinder reinforced concrete pipe 11 feet 6 inches in diameter, furnished and delivered by the Commission, extending westerly from Norumbega Reservoir, being constructed under Contract 80, about 10,350 feet of this pipe extending easterly from the reservoir to the proposed Charles River Shaft, and about 2,200 feet of similar but smaller pipe 7-feet in diameter in a branch con-



CONTRACT 79.—Placing the Precast Pipe in the Pressure Aqueduct. Handling an 11-foot 6-inch Diameter Pipe by Gantry Crane Straddling the Trench.



CONTRACT 81.—Handling 11-foot 6-inch Diameter Pipe by Two Cranes Working Together on One Side of Trench.

nection from the main pressure aqueduct line to the Weston Aqueduct terminal chamber. The work includes constructing appurtenant works particularly to provide a connection with the Weston Aqueduct supply mains at the point where the 7-foot line crosses underneath the three existing 60-inch supply mains.

The contractor commenced clearing along the aqueduct line May 1 at a point west of Oak Street and started trench excavation about two weeks later with a 62-ton crane equipped with a 1½-cubic yard drag bucket. The 11-foot 6-inch pipe units were furnished and delivered along the line in the same manner as previously described for the other laying contracts and the method of preparing foundations and cradling the pipe, etc., was the same.

Pipe laying commenced June 28 at Oak Street and continued westerly. The pipe was placed by one 62-ton and one 50-ton crane used simultaneously and operated on their caterpillar treads close to the edge of the trench, these being the same cranes as were from time to time equipped with drag buckets when used for excavating. The laying of 992 feet between Oak Street and Norumbega Reservoir was completed July 20. The laying of 4,917 feet west of the reservoir started August 22 and was completed October 16. Laying was then resumed at Oak Street October 27 and had continued 2,429 feet easterly by the end of the year, a total of 522 pipe sections, or 8,338 feet, being laid during the year. Pipe laying was done with one 8-hour shift. The average number of sections placed on each day when pipe was actually placed was 8. The maximum in any one day was 21. The laying of 7-foot pipe for the branch connection to the Weston Aqueduct terminal chamber commenced August 15 at the main aqueduct, both excavation and laying being done with a 50-ton crane. The first 700 feet of this line was in low land near the Charles River and it was necessary to pump from well points installed along both sides of the trench. About 12 inches of crushed rock was placed in the trench bottom to insure good foundation. The line was anchored against floating for a length of about 800 feet adjacent to the terminal chamber. The line parallels the three existing 60-inch cast-iron supply mains. The trench throughout this length was almost entirely in hard rock which had to be removed with great care to avoid damage to the existing mains. The removal of this rock was nearly completed at the end of the year. This 7-foot line also passes beneath these mains at River Street and the work of supporting them during the excavation was well advanced. A total of 151 pipe sections, or 1,808 feet, were laid during the year. The pipe manufactured under Contract 85 was delivered along the line well in advance of the contractor's laying operations. By the end of the year 12,368 linear feet of 11-foot 6-inch pipe and 2,196 linear feet of 7-foot pipe were delivered. To provide for this delivery, the laying contractor constructed roads 35 feet in width along the entire line. The average number of sections placed on each day when pipe was actually placed was 5, the maximum in any one day was 14. Final caulking and mortaring of the inside joints had not been started on either size of pipe. For mortar-filling of the outside joints, batches of purchased aggregates and cement supplied by the Commission were trucked to the job from a batching plant in Weston.

The value of work included in contract estimates to November 29, the date of the latest estimate, was $244,200.25, of which 90 per cent has been approved for payment. The contractor's force averaged 80 men, the maximum being 120 for the week ending December 2, 1939.

The principal items of plant were as follows:

1	50-ton crane
1	62-ton crane
2	Power shovels
2	Truck cranes
2	Dragline excavators
3	Caterpillar-tractor bulldozers
	Miscellaneous trucks, air compressors, pumps, concrete mixer, etc.

The total work done and materials furnished to date under the principal items of Contract 81 are shown in an accompanying table.

Contract 89.—Bids were opened October 26, for constructing mortar lining in the old steel pipe siphons of the Weston Aqueduct in the towns of Framingham and Wayland. This is a PWA contract. Five bids were received, ranging from $38,417.75 to $47,753.72. The contract was executed November 6 with Marinucci Brothers & Company of Boston, Mass., the lowest bidder. The work consists of cleaning the old 90-inch steel pipe siphons of the Weston Aqueduct, 4,725 feet long, in continuous service for the past 37 years, and lining them with about 12,000 square yards of Portland cement mortar; and includes about 14,000 linear feet of fencing. The contractor started work November 13, erecting staging at the Sudbury River arch. At the end of the year the pipe arch across the river had been sand blasted and was ready for painting, cleaning inside of the Sudbury River siphon was started and all fence posts set at the Happy Hollow siphon. The contractor's force averaged 13 men, the maximum being 20 for the week ending December 2, 1939.

No estimate for payment was made before November 30.

Quabbin Reservoir and Aqueduct Division

The Quabbin Reservoir and Aqueduct Division continued in charge of the work on the Ware River watershed, of the maintenance of the Rutland-Holden Sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, of the construction of the Winsor Dam, shallow flowage regulating dams, reservoir clearing, and access roads in the vicinity of the administration buildings at Winsor Dam and the supervision of the construction, as a WPA project sponsored by the Commission, of a sewerage system for the Town of Holden.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 52, 61, 62, 63, 64 and 82, monthly estimates for Contracts 65, 66, 72, 88 and 93, and final estimates for Contracts 56, 60, 61, 62, 63, 64, 65, 88 and 98 were prepared. Additional real estate plans were prepared of miscellaneous properties in the Ware River watershed. The preparation of construction plans for sewerage systems in the towns of Rutland and Holden was completed. Taking plans were prepared for these towns covering the real estate required to be taken by them for the sewer construction and assistance given to them in preparing the takings. Plans and studies were made of methods of disposing of sewage in the towns of Boylston and West Boylston in the Wachusett watershed, involving to date about 134 acres of topography. Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield until July 1, and thereafter in the administration buildings in Belchertown. Continuous records were kept of the flow of the Swift River at Winsor Dam. Work on the record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem were completed and work continued on the record plans of the Petersham-New Salem Highway. Contract drawings were completed for the proposed access highway via Quabbin Hill between Winsor Dam and Quabbin Dike, which the Commission has named Administration Road. Contract drawings were made for the completion of the East Branch Baffle. Plans were made for remodeling dwelling houses in the vicinity of the administration building. Photographs of the progress of construction were taken.

Miscellaneous Field Work

Lines and grades were given for construction under Contracts 52, 56, 60, 64, 65, 66, 88 and 93. Periodic readings of the ground water level in numerous test wells were continued during construction operations at Winsor Dam, and similar observations were continued at the Quabbin Dike. Limits of the reservoir clearing and grubbing areas were surveyed, sawdust piles measured totaling 77,000 cubic yards, and other miscellaneous items to be removed from the reservoir site were located. In the latter part of July a weir was built across the Swift River about 800 feet downstream from the Winsor Dam spillway channel, and an automatic recording gage record made supplemented by other gage readings during the contractor's operation of plugging the stream-control tunnel which carried the flow of the Swift River past Winsor Dam. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct.

Storage buildings were made available near the group of administration buildings by the repair of existing farm buildings in the vicinity and by the erection of some new buildings.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

Quabbin Aqueduct and Ware River Intake Works

At the lower intake at Shaft 12, temporary barricades against floods on the East Branch of the Swift River were removed, stop shutters, racks and one-way shutters to permit the draft of water from Quabbin to Wachusett Reservoir were placed in position, trash racks were removed and the entire intake made ready for operation.

At the top of Shaft 11A hinged timber gates were installed on the eight openings, to permit the discharge into Quabbin Reservoir of flood flows from the Ware River, and to prevent any reverse flow or draft from the reservoir, and the entire outlet works at this point made ready for operation. The Ware River intake works were maintained ready for operation whenever required. The electric transformers at Shaft 9 which were damaged during the hurricane of the previous September were reconditioned.

The tunnel bulkhead 2,200 feet west of the Ware intake at Shaft 8 was removed under Contract 98, as hereinafter described. A gasoline-driven hoist purchased by the Commission was installed for emergency use in the head house at Shaft 4. The work of changing over the 144 x 90-inch Venturi recorder at Shaft 1, to operate on the full pressure of Quabbin Reservoir, was begun September 29 and completed November 15. This consisted of removing the existing float wells and installing a new pressure recorder purchased by the Commission. Upon completion of the installation of control gates at the Wachusett outlet of Quabbin Aqueduct at Shaft 1, under Contract 65, as hereinafter described, the 900-horsepower motor for driving the tunnel unwatering pump was removed from the dry well on May 25. The tunnel was entered at Shafts 4, 8, 9 and 12, at intervals, final inspection being made on December 22 when temporary fine racks at the bottom of Shaft 4 and all sump guards in the tunnel were removed. The depth of water standing on the invert during unwatering operations for inspection purposes varies generally from about 4 to 15 inches except between Shaft 3 and the pump sump at Shaft 1, where it flows at higher velocity and much less depth.

Rutland-Holden Sewer

Operation.—The Rutland-Holden Sewer was in continuous operation. The entire length of the line and the meter stations at the Rutland State Sanatorium, at the U. S. Veterans Hospital in Rutland, and at the Holden-Worcester boundary line were inspected regularly, weirs and piezometer connections cleaned, records of flow maintained, and necessary repairs made.

Holden Sewer System.—Work was begun September 28 under the Commission's agreement with the Town of Holden for the construction of a system of sanitary sewers in cooperation with the Federal Works Progress Administration.

The first pipe was laid October 27. During the year 1,096 feet of 8-inch sewer pipe and 785 feet of 10-inch sewer pipe were laid and two manholes constructed. The weekly average rate of laying was 376 feet and the maximum 661 feet. The average number of men employed on this WPA project was 64 and the maximum 168. Under the terms of its agreement the Commission furnished the necessary equipment, the major items of which were as follows: two 105-cu. ft. min. compressors, four paving breakers, two 3-leg derricks, two melting furnaces, one 5-cu. ft. concrete mixer, miscellaneous pumps, jack hammers, etc.

Wachusett Watershed

Boylston and West Boylston Sewer.—Continued studies were made of the feasibility of collecting and diverting sewage of the towns of West Boylston and Boylston out of the Wachusett watershed. About 134 acres of topography were involved.

Ware River Watershed

Maintenance.—A small labor force was employed throughout the year in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 and Shaft 9 head houses, setting stone bounds, reforestation and other miscellaneous work. In connection with the Commission's sponsorship of the WPA sewer construction in Holden, all lines and grades were given and the construction work superintended. A small labor force was used to reconstruct the outlet of Brigham Pond and repair the destruction caused by the flood of the previous September. The average number of men so employed was 28, the maximum being 44 during the week ending April 29.

Reforestation.—Reforestation in the Ware watershed was continued by the planting of transplants from the Commission's nursery at Belchertown, consisting of 100,000 European larch 2-year seedlings.

Fire Protection.—Forest fire equipment continued to be housed in a building of the Commission near the intake works and was maintained in readiness for service at all times. Four assistants in the engineering force continued as deputy forest fire wardens in the towns of Barre, Hubbardston, Oakham and Rutland. The Commission's force responded to alarms for two forest fires within the Ware Watershed, which burned over an area of 3 acres.

Quabbin Reservoir

Topography.—The taking of topography in the area below the flow line of the reservoir was continued. To date 29,960 acres or about 46 square miles have been surveyed for the general topographic maps within and adjacent to the proposed reservoir. Work on the location of the flow line was continued. A small labor force was employed in connection with this work.

Policing.—Police protection was continued with barriers erected across all the main roads into the reservoir area with men stationed at all such points to prevent the general use of these roads except by contractors engaged in the clearing and other operations within the area.

Real Estate.—Properties described in applications by owners for sale of real estate were located, and when no surveys had been made, sketches showing the approximate location were prepared. Properties purchased or taken by eminent domain were plotted on the general property map as the deeds were received and surveys completed. Real estate surveys during the year cover 30 acres, making a total to date of 80,600 acres or 126 square miles. Of this total, 80,500 acres have been plotted on a scale of 1 inch=200 feet.

Photography.—The photographing of buildings, cemetery lots and construction was continued. During the year 1,336 photographs were taken of miscellaneous views and progress of construction at Quabbin Reservoir and 49 in the Ware River watershed. Prior to May 23, at which time the Southborough-Framingham Division established its own photographing laboratory, 535 photographs were taken on the pressure aqueduct line by the Quabbin Reservoir and Aqueduct Division.

Cemetery Removals.—Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. Removals have been completed during the year from Bacon Cemetery in Belchertown, Howe and Packardsville cemeteries in the former town of Enfield, Jason Powers and Town House cemeteries in the former town of Prescott, and from old North Dana, Town, Williams and Pine Grove cemeteries in the former town of Dana. Removals during the year included a monument to General George Washington from Town House Cemetery in the former town of Prescott. All removals from cemeteries below the flow line of Quabbin Reservoir were completed August 28. Of the estimated total of 7,500 bodies to be removed, 7,133 have been removed to date.

During the year work progressed as shown in the following table:

CEMETERY REMOVALS

		To Nov. 30, 1938*	Year ending Nov. 30, 1939	Total
Burial lots in Quabbin Park Cemetery assigned in exchange		619	80	699
Burial lots in Quabbin Park Cemetery sold		34	6	40
Number of releases executed of rights in old lots in Quabbin Reservoir area	to Q. P. Cemetery	611	86	697
	to other cemeteries	269	15	284
Bodies removed from Quabbin Reservoir area	to Q. P. Cemetery	5236	911	6147
	to other cemeteries	944	42	986
Bodies moved from area outside Quabbin Reservoir to Quabbin Park Cemetery		4	—	4
Burials, not reinterments, in Q. P. Cemetery		133	19	152
Headstones moved	to Q. P. Cemetery	2903	424	3327
	to other cemeteries	448	24	472
Monuments moved	to Q. P. Cemetery	344	23	367
	to other cemeteries	149	3	152

*Includes corrections of previously reported data. Quabbin Park Cemetery was not completed for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

The vault was maintained and used from time to time during the winter months. Cemetery lots were graded and seeded as removals were completed, and in case of purchases, were graded and seeded at once. A small wooden building was moved from the reservoir area and placed on new foundations near the south end of the cemetery for use as a tool house. The average force employed on cemetery work during the year was 14 men, the maximum being 23 during the week ending July 29.

Fire Protection.—The fire-fighting equipment was maintained in readiness for service at all times, one fire truck being stationed at Pelham Hill, one at Dana Centre, and the remainder of the fire-fighting equipment being housed at the administration building. An average of 14 men were employed for 43 weeks, commencing January 16, cleaning up the hurricane-felled timber and slash along the roads and highways in areas where a dangerous fire hazard existed. Four automobile chassis purchased by the Commission were converted to fire-fighting equipment by the construction of special bodies. One of these trucks was sent to the Ware River intake works September 17, for use in the Ware watershed. Several of the assistants in the division office were appointed as deputy fire wardens in the Town of New Salem. The equipment and personnel responded during the year to calls for assistance at 4 forest fires which burned over a total area of 104 acres. There also occurred one building fire. Fires due to operations by the clearing contracts burned over a total area of 1,135 acres. An average of 25 men were employed for 17 weeks reclearing fire stops along the property taking line. An average of 8 men were employed for 16 weeks clearing all hurricane-felled trees and brush, and making old and discontinued roads available for access of fire equipment.

Lumbering.—Hurricane-felled timber was mapped and estimates made of its quantity. Various lumbermen continued cutting operations under agreements with the Commission for the purchase of standing timber. In addition an average force of 32 men was employed from December 1 to August 31, salvaging hurricane-felled timber for sale to the Northeastern Timber Salvage Administration, Mass. Division. This government agency was permitted to use Hacker and South Spectacle ponds in New Salem for water storage, and a site in the former town of Dana for dry storage. During the year the Commission's forces salvaged and delivered about 2,364,400 board feet to these ponds and about 545,000 to the dry site, making a total of about 2,909,400 board feet.

Reforestation.—The general program of reforestation was continued with stock from the Commission's nurseries. Watershed planting was done April 19 to 27, with an average force of 13 men on areas outside the flow line in the towns of Ware and Prescott, and September 5 to 29, with an average force of 37 men in the towns of Enfield, Greenwich and Prescott. The Quabbin watershed planting during the year is summarized as follows, not including the 102,385 European larch 2-year seedlings which were used for replacement planting, and which show a survival to date of 75 per cent.

Species	Type of Transplants	Quantity	Acres Planted	Per Cent of Survival to Date	Cost per M for Planting
White pine	4-year	209,070	440	90	$7.62
Red pine	4-year	355,300			

Plantings in previous years show survival to date as follows:

1935	60 per cent
1936	40 " "
1937	90 " "
1938 including replacements	90 " "

Spring planting included 100 pounds of white pine, 100 pounds of red pine, 50 pounds of European (Tyrolean) larch, and 25 pounds of Hemlock seed.

Fall planting consisted of 100 pounds of white pine seed.

General maintenance work and additional planting was done in the Belchertown Nursery.

A summary of the stock now in the nursery is as follows:

One-year seedlings	3,303,000
Two-year seedlings	2,025,000
Three-year seedlings	700,000
Three-year transplants	1,225,000
Four-year transplants	2,282,000
Total	9,535,000

The nursery also contains about 4,800 trees and shrubs taken from the reservoir area and also from the Weston Nursery land taken by the Commission for the construction of the new pressure aqueduct in the Wayland-Weston Division.

General maintenance of the Belchertown Nursery included spraying of trees for control of gypsy moths and other insects, weeding seed and transplant beds, placing and removing snow fences, digging drainage ditches and laying water pipe for watering the nursery stock. This work was carried on from April 11 to November 13 with an average force of 19 men.

Clearing Area to be Flooded.—The experimental clearing of about 530 acres north of Winsor Dam was continued to completion and served as a guide to the contractors engaged in the main reservoir clearing operations. An average labor force of 16 men was employed for this work between January 12 and June 20. To do necessary reclearing of the lower portions of the reservoir in advance of the flooding, an average labor force of 53 men was employed commencing September 2.

Maintenance.—A labor force was employed throughout the year for miscellaneous maintenance work including maintenance of the completed Quabbin Dike and access roads. Following the sale and removal of buildings owned by the Commission above the flow line, considerable debris was left in and around the cellar holes. In order to eliminate the fire hazard and prepare the areas for planting, these cellar holes were cleaned up, the debris burned and the cellar holes filled in with a bulldozer. Considerable repair work was done on roads above the flow line to keep them passable during reservoir clearing operations. During the year temporary barriers were erected and maintained on roads leading into the valley. Of the temporary barriers erected 26 were replaced with permanent gates on main roads leading into the valley. The work of setting stone bounds to mark the general taking plan and outlying properties of the Commission was continued. The average number of men so employed was 26 the maximum being 80 for the week ending September 2.

Remodeling and Repairing Buildings.—Two houses in Belchertown conveniently located near the administration building, one in New Salem, suitable for housing fire equipment, and one on Prescott Hill, suitable for a fire lookout station, were remodeled and repaired as permanent additions to the equipment for maintenance, and other miscellaneous repairs were made to buildings in temporary use. The average number of men so employed was 4.

Administration Buildings.—The newly built administration buildings were prepared for occupancy following acceptance by the Commission. General occupancy by all departments, except the laboratories and field forces on contracts for clearing and for regulating reservoirs, was made on January 30.

The grounds were maintained and improvements made in the local drainage following the heavy storms of last fall. Tests were made the first of each month of the automatic sprinkler system. The auxiliary lighting plant located in the west garage building was tested periodically. This system was used June 17, following a high wind storm in this area when outside power service was disrupted due to broken wires caused by fallen tree limbs.

The automatic oil burner boiler of the heating system has been in successful operation, except that it was shut off during the summer, from May 20 to September 19. During this period the summer hot water heater was in operation. It was found possible to maintain a satisfactory average temperature for about 56 degrees in the underground patrol building and seaplane hangar, without material assistance from the main heater, so that considerable economy in fuel is realized. Commencing April 9, all vehicular repairs were taken care of at the repair shop in the west garage at a considerable saving in cost compared with outside flat-rate charges.

Soil Testing Laboratory.—The work of exploring, collecting and testing materials from embankment construction was continued. Following a fire which destroyed the laboratory building on March 23, records and salvaged equipment were removed to the former division office in the so-called Chandler house. Benches, shelves and cabinets were constructed for temporary use and extensions made to the water piping and electric lines so that testing could be resumed March 25. During the year equipment for soil testing was transferred to the Commission's laboratory in the Wayland-Weston Division office at Natick and such other equipment as was suitable was transferred to the Commission's concrete testing laboratory on Speen Street in Natick.

Collection and testing of materials from the selected borrow areas and from the core and beach of Winsor Dam to determine permeability and relative characteristics were continued until the hydraulic-fill and rolled-fill types of construction were completed. Permeability tests of embankment materials and acceptance tests of proposed aggregates were made in connection with the construction of the regulating dams and highway construction in the reservoir area. During the year 1,971 samples were collected, making a total to date of 28,200 samples from Winsor Dam alone. A small labor force was employed in the collection of samples.

Sampling from the settled cores was continued periodically through the ports of the observation wells in Winsor Dam and Quabbin Dike and tested for size gradation and porosity to determine the extent of consolidation. The consolidation of the core around these wells produced sufficient vertical load by friction and by actually bearing on the pipe flanges to buckle the pipe of ½-inch plate at a depth of about 130 feet in each well. The wells were reinforced as necessary by additional pipe sleeves on the inside made of four quadrants of 1-inch plate backed with concrete.

Until the Commission's laboratory was established in Natick, acceptance tests were made on concrete aggregates for the pressure aqueduct construction. Spelter tests of zinc used in galvanizing and other acceptance tests were made for the large quantity of fencing required along the pressure aqueduct and for the Spot Pond By-pass.

Chemical and Bacteriological Laboratory.—The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued. Regular samples have been collected and tested from stations on the Ware, Swift, Quaboag and Chicopee rivers.

The fire which destroyed the laboratory March 23 resulted in almost complete loss of the equipment. Temporary quarters were established in the former division office as was done in the case of the soil testing laboratory. In the emergency, the cooperation of the Department of Public Health through its laboratory in Westfield and the State Agricultural College at Amherst was very helpful. The laboratory continued the supervision of treatment of fines wasted from the contractor's operation in the construction of Winsor Dam. The commencement of filling of the reservoir necessitated discontinuing the electric power lines November 17. The Commission purchased and installed at the laboratory a 15-kilowatt gasoline-driven generator suitable for later permanent installation as an emergency unit at the Ware River intake building. A small labor force was employed in the collecting and handling of samples.

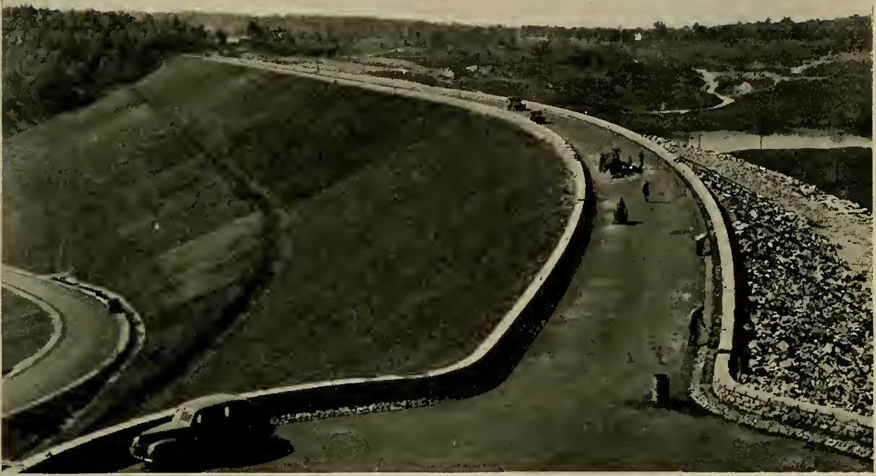
Progress of Contracts

Contract 51.—Following the judgment which was entered September 25 in the amount of $8,712.98, in the case of the petition for $191,767.62 by the contractor, the Franklin A. Snow Company, the final estimate previously reported in the amount of $199,045.99 was revised to the amount of $198,407.01 and dated October 26. This did not include the amount of the judgment.

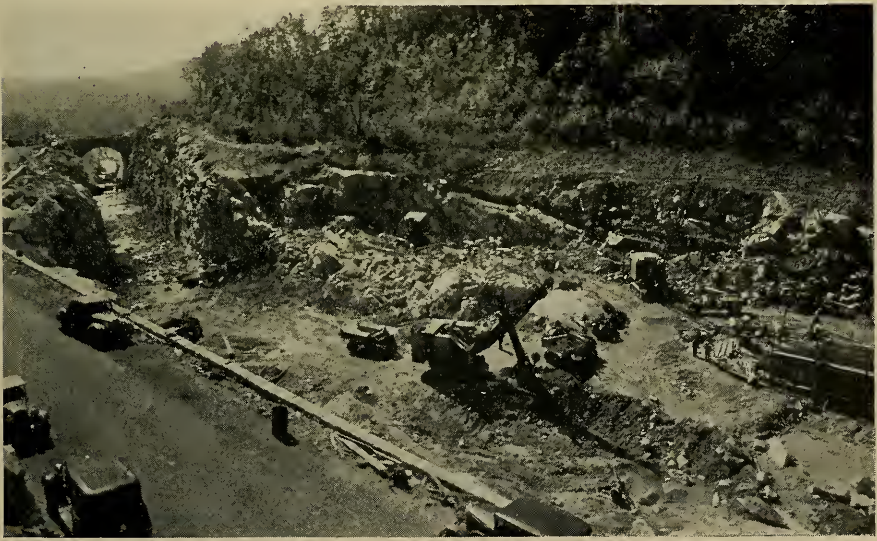
Contract 52.—Contract 52, with Benjamin Foster Company, for constructing the embankment of Winsor Dam in the towns of Belchertown and Ware, was continued throughout the year. Hydraulic-fill operations had been completed the previous year and jetting of the core through the ice on the pool was discontinued about the middle of December. The dam was topped off with selected materials spread and rolled during the later stages of the hydraulic-fill operations. The outer slopes had been steepened to furnish some of the material used in topping off. Draglines were used to cut the slope back to grade. Work was shut down for the winter December 10 and resumed early in April when the core pool was drained. Unsatisfactory material in the core in the east end of the dam was replaced with satisfactory material and the placing of the rolled fill started. Impervious material for the core was obtained from top soil borrow pits west of the dam and from a glacial till pit east of the north end of the spillway channel.

The impervious core was completed May 26 and the pervious portion of the embankment practically completed by the end of June. Crushed stone obtained by crushing rejects from the hydraulic-fill excavation was hauled to the top of the upstream slopes in trucks, dumped and spread by bulldozer for a blanket under the riprap. This blanket was practically completed August 3. Riprap consisting of suitable large fragments from the spillway excavation was trucked to the upstream face and dumped into place. This work continued through the winter. It was pushed from the top of the slope by bulldozer and trimmed to the required finished slope of the upstream face by crane. The riprap was practically completed by the first of September, a total of 132,000 cubic yards being placed.

Stone walls along both sides of the top of the dam were built of field stone with a cap of rough quarried granite which the contractor elected to set rather than hunt for large satisfactory field-stone caps. Work started on the walls June 15 and they were practically complete, except for the capstones, July 22. The caps were not set until after the road sub-base was graded so that settlement of the fill would not affect the relative height of the wall above the road. The walls, including capstones, were practically completed August 19.



Contract 52.—Looking Westerly Along Winsor Dam of Quabbin Reservoir. Administration Buildings at Further End.



Contract 52.—Excavation for Winsor Dam Spillway Showing Spillway Channel at Left and Bridge for East Access Road.

The road surface across the dam was completed September 11 and the paved curbs October 5. When the downstream slopes were roughly graded and before placing the soil dressing, the drop inlets and tile pipes of the drainage system were installed. The main 24-inch drain constructed under a previous contract was extended to its outlet at the river and completed November 18. Work of completing the observation wells for access from the top of the dam to the center of the core was in progress at the end of the year.

Soil dressing on the downstream face was started May 1 and practically completed by the end of July. The soil was dumped at the top of the slope and pulled into place by a bulldozer equipped with a long wooden blade.

The contractor resumed the placing of concrete in the intake building in April, the construction of stone masonry May 1, and interior tile work May 24. Walls were built up a few courses at a time and the structure practically completed November 14. The installation of the traveling crane was completed June 2 and was used by the contractor in his tunnel-plugging operations. The concrete roof slab was poured September 25. The promenade tile deck was placed over insulation and waterproofing and completed November 3. The parapet walls were covered with sheet lead over which the capstones were placed on dowels. The building was practically complete at the end of the year.

The 48-inch sluice gate on the permanent 48-inch outlet pipe was installed June 3 to August 5. During July and August power and telephone connections were laid connecting the intake building with the administration building.

The contractor commenced the work of plugging the river diversion tunnel June 5 with the installation of two 36-inch valves on the temporary siphon by-pass. On June 17 he started unwatering the central bay into the stop logs. Considerable difficulty was encountered due to debris and a diver's helmet had to be used in seating the logs. The contractor first attempted to pump concrete from his aggregate and mixing plant on the boathouse ramp through the intermediate intake and down the shaft to concrete the tunnel plug. After repeated failures the concrete mixer was moved to the top of the dam adjacent to the intake building and on July 14 concrete was poured down a 20-inch steel pipe hung in the shaft. The temporary siphon was completed in the central bay and put in operation July 19. The east and west bays were then closed off and the entire flow of the river passed through the siphon July 21. Commencing July 31 a concrete plug of about 950 cubic yards was placed in a continuous pour which was completed in 78 hours on August 3. This sealed off the tunnel upstream and left about 200 cubic yards to be placed around the 48 x 78-inch sluice gate and the 72-inch steel outlet pipe, etc. Forms for the remaining concrete had been built and the gate set in position at the end of the year. Due to the slow rise of the water in the reservoir a considerable delay was anticipated in discontinuing the temporary siphon and diverting the flow as required through the 48-inch outlet pipe. However, the successful handling of the river flow by the siphon method had been so well demonstrated that the contractor installed a second temporary siphon of 20-inch pipe constructed in the intake well so as to be easily removable. By this means the river flow was diverted from the original siphon into the 48-inch line October 18. This allowed the tunnel downstream from the plug to be unwatered without waiting for the otherwise necessary rise in the reservoir level. By November 6 the reservoir had risen sufficiently to submerge the entrance to the 48-inch line and the second siphon was removed.

Construction of the lower intake fill across the entrance to the stream control tunnel was started July 22 following the installation of a temporary 36-inch pipe in the bottom of the tunnel approach channel through which all the flow of the river was diverted. The fill was composed of upstream and downstream sections of rock from the spillway and a tight core of top soil and gravel. The fill was completed and capped August 17 with a concrete beam spanning the wing walls of the intake approach and forming the permanent sill of the lower intake at elevation 427, 47 feet above the original river bed. At the end of the year the river was still flowing through the temporary 36-inch pipe and the base of the lower intake fill.

The contractor built a cofferdam across the outlet of the river diversion tunnel October 18 just above the point of discharge of the 48-inch line which in 1932 was embedded in the tunnel lining under Contract 30 in anticipation of and in preparation for this event. This fill was then extended into the tunnel by end-dumping from trucks, draining the displaced water out through a ditch along the southwest wall of the tunnel. The tunnel fill was completed November 2 with material taken from stock piles made from materials excavated in the spillway and outlet channels and from a nearby borrow pit. As soon as the fill was extended to the tunnel plug, excavation of the fill and the debris was made for the concrete block foundation supporting the main 72-inch steel outlet pipe at its elbow just downstream from the plug. Concrete foundations for the outlet structure were placed up to the level of the tunnel fill November 9. The 48 x 72-inch sluice gate and frame were then brought in over the fill and raised into position in the shaft. The 34-foot sections of the 72-inch steel pipe lines were brought into the tunnel over the same route. At the end of the year the first 22 sections of pipe below the sluice gate were assembled each on two concrete footings and the first 15 joints were riveted.

The contractor started the construction at the outlet works May 20 with a timber cofferdam at the recess in the east tunnel wing wall for the installation of gates in the 48-inch outlet line. Cofferdams were also built around the discharge ends of the Venturi meters using sections of steel pipe fitted inside of the end rings and held in place by filling inside square timber cofferdams. By June 10 the 48-inch pipe from the intake works and both Venturi meters buried beneath the river channel had been cleaned out. Early in August the work of installing the 48-inch gate valve, a 48-inch Dow-disc valve, and special fittings was completed. The operating stems of the valves were housed in a temporary wooden building November 20. At the end of the year good progress had been made on excavation, construction of forms and placing of reinforcing steel for the foundations of the outlet building.

The contractor commenced the final grading of the outlet channel May 31. The bottom, which had been materially altered by the flood of September 21, was cut down to approximately elevation 380 with riprap berms at the sides. At the end of the year good progress had been made in regrading and loaming the slopes of the deep channel cut.

In the second week of December the contractor resumed the excavation of ledge and earth for the main spillway channel. Material not suitable for riprap on the dam was used to construct the fill for the extension of the spillway weir road. Excavation was continued throughout the year. In August the contractor resumed excavation of the spillway channel south of the bridge. Earth excavation just south of the bridge was continued intermittently and practically completed by the end of the year. Rock excavation commenced at the extreme south end of the channel in September. Two steam shovels were used and the work nearly completed at the end of the year.

When the foundation of the spillway weir was exposed, portions were found badly shattered and about 400 cubic yards were required to be excavated by barring and wedging. Along portions of the west side of the spillway approach channel the ledge surface opposite the weir was, in a few short stretches, lower than anticipated and it was necessary to build retaining walls to hold the earth slopes above the rock cut. These walls were built of rubble masonry using field stones for the exposed face and quarry granite for the caps. An almost continuous wall had to be built along the west side of the approach channel. Good progress was made in grading and loaming slopes of the entire spillway channel.

The concrete footings for the spillway weir were placed and the first stone laid September 13. The stone masonry of the downstream face was laid up three courses at a time and concrete placed between it and an inclined form, built about 2 feet back from the upstream face. This method was used because of the difficulty of laying the flatter sloping upstream stone face without concrete close behind it to brace against. Two galvanized steel strap anchors 36-inches long set in holes in the top face of the stone tied each stone to the concrete.

Steel waterstops were set in the joints of the concrete. The crest stones were set dry and the joints under them filled by forcing grout down through the holes drilled in them for dowels. When the grout was hard, holes for the dowels were drilled down into the concrete, grout placed in the hole, and the dowel forced down into the hole. At the end of the year the masonry for the longer section of crest at elevation 530 was practically complete and good progress made on the shorter depressed section at the north end of the weir. Thirty-six 20-foot holes for grouting were drilled in the foundation and extended with pipe through the weir to connections on the upstream face. After sufficient masonry was placed, late in October, the holes were grouted. The rock was very tight, taking only about eight cubic yards of grout in the whole length of the weir. A flight of granite stairs at the northeast end of the weir was built during October and November, and was completed except for the pipe hand rail and a portion of the rubble facing of the outside wall of the stairway.

The contractor resumed May 5 the waterproofing of the extrados of the arch and inner faces of the spandrel walls and completed the work June 2. The contractor resumed the laying of masonry April 13. As fast as the stone was laid in the spandrel walls, concrete was placed behind it, and all concrete was in place May 27. The arch forms were stripped late in April and the intrados cleaned. Laying of stone was resumed June 22 in the parapet walls which were completed July 10, except for capstones. The tops of the random ashlar parapet walls were covered with sheet lead. Holes were drilled through it into the masonry below and dowels set in these holes were leaded in. The capstones were set over these dowels with mortar only along the face of the joints and the space under the stone and the vertical joints filled with grout. Work on the roadway across the bridge was started July 15. Curbs were built and the sidewalks placed behind them. An excellent finish was obtained on these walks by working granite chips into the surface of the granolithic finish before it had set up. Asphalt macadam surface was placed on the roadway and the bridge completed at the end of the year.

Work was continued intermittently throughout the year on the grading, culverts and surfacing for the spillway weir road, the east and west access roads to Winsor Dam and the road from the top of the dam to the outlet works. These were practically completed at the end of the year except for a portion of the cable-guard rail, miscellaneous work of surfacing parking areas, loaming and seeding side slopes and a considerable portion of the road to the outlet works which must necessarily be left until the construction of the latter is further progressed. Excavation for the seaplane ramp from the patrol building was started April 18 and completed May 19, the excavated material being used to extend the lower end of the ramp and also for the rolled fill on the dam. The stone-masonry faced concrete sidewall of the ramp along which the service boats will be docked was completed August 19. For paving the ramp, the contractor used stone from walls along the old Quabbin Hill and Blue Meadow roads. Paving was flushed with grout except for the crushed stone surrounding the ties laid to support rails for the seaplane dolly. The work was completed October 21. The face of the wall was dressed for guard timbers which were bolted on to form buffers for the docking of boats. The ramp was completed November 3 except for the removal of the contractor's aggregate batching plant located on the fill at the lower end of the ramp. The grading, soil dressing and seeding of the auxiliary spillway west of the administration building was completed. The granite capstones of the weir were set in August and the grouting of their steel anchors completed early in November.

The value of work included in contract estimates during the year was $581,476.02, or a total to November 15, the date of the latest estimate, of $2,149,798.02, of which $1,984,818.22 has been approved for payment. The contractor's force averaged about 158, the maximum being 268 for the week ending July 29. In general the contractor worked one 8-hour shift and six days a week, occasionally two 8-hour shifts.

The total electric energy used by the contractor during the year was 967,300 kilowatt hours making a total to date of 10,604,700 kilowatt hours.

A few minor items of equipment were added during the year. The contractor has at various times hired three small power shovels, two truck cranes, one sheep's-foot roller and miscellaneous trucks and concreting equipment.

The following recognized subcontractors did work under the contract during the fiscal year:

Lane Construction Corp.	Bituminous macadam road surface.
United Fence Co., Inc.	Cable guard on spillway weir road.
Peter Ouimette, Inc.	Waterproofing, insulation and copper flashing on roof of intake structure.

The total work done and materials furnished to date under the principal items of Contract 52 are as follows:

Earth excavation	201,260	cu. yds.
Rock excavation	101,150	“ “
Consolidated pervious embankment	33,440	“ “
Rolled impervious embankment	1,900	“ “
Embankment by full-hydraulic method	3,442,000	“ “
Miscellaneous embankment	159,200	“ “
Selected coarse material	133,000	“ “
Crushed stone or screened gravel	32,510	“ “
Light riprap	118,900	“ “
Heavy riprap	21,600	“ “
Soil dressing	47,600	“ “
Furnishing and placing grout	950	“ “
Portland cement	23,370	bbls.
Concrete, Class A	3,810	cu. yds.
Concrete, Class B	4,300	“ “
Concrete, Class C	600	“ “
Reinforcing steel	164,400	lbs.
Steel pipe for 68-inch conduit	273,200	lbs.
12, 18 and 24-inch tile pipe	8,370	lin. ft.

Contract 56.—Contract 56, with Rich Bros. Construction Co. Inc., for constructing the administration buildings at Winsor Dam of Quabbin Reservoir in the Town of Belchertown, was completed.

The value of work included in contract estimates during the year was $2,733.70, the final estimate, dated April 27, being for $382,118.09.

Contract 60.—Contract 60, with the Middlesex Construction Company, for constructing access roads to Shaft 12 of Quabbin Aqueduct in the Town of Hardwick, was completed with the necessary removal of equipment.

The final estimate, dated January 16, was for $81,625.29.

Contracts 61, 62 and 63.—Contracts 61, 62 and 63, PWA contracts, with Coleman Bros. Corp., for clearing portions of the site of Quabbin Reservoir on the West Branch, on the Lower Middle and East branches, and on the central portion of the Middle Branch, respectively, of the Swift River in the towns of Belchertown, New Salem, Pelham, Shutesbury, Ware, Hardwick and Petersham, were completed October 2, October 27 and October 2, respectively. Work continued throughout the year on all three contracts. The extent and character of the work done is indicated in the following table:

	Contract 61	Contract 62	Contract 63
Area cleared	5,155 acres	6,445 acres	4,120 acres
Woodland	60 per cent	25 per cent	50 per cent
Brushland	30 “ “	50 “ “	35 “ “
Openland	10 “ “	25 “ “	15 “ “
Area grubbed	88.5 acres	42 acres	2 acres
Excrementitious material satisfactorily disposed of from privy vaults, cesspools, stables, etc.	532 cu. yds.	1,804 cu. yds.	509 cu. yds.
Earth excavation used for filling cellar holes, privy vaults, manure pits, etc.	26,957 “ “	55,371 “ “	14,166 “ “
Masonry walls and chimneys razed	258 “ “	1,216 “ “	351 “ “

The value of work included in contract estimates during the year for Contracts 61, 62 and 63 was $273,203.85, $351,449.05 and $211,846.30, respectively, the final estimates for these amounts being dated October 30, November 9 and October 30. On Contract 61 the contractor's force averaged 188 men for a period of 44 weeks, the maximum being 349 for the week ending May 13; and on Contract 62, the contractor's force averaged 124 men for a period of 48 weeks, the maximum being 349 for the week ending May 13; and on Contract 63, the contractor's force averaged 127 men for a period of 41 weeks, the maximum being 448 for the week ending July 29.

The principal items of equipment used on the three contracts were as follows: 6 caterpillar tractors, 5 equipped with bulldozers, some with saw teeth on the bottom of the bulldozer blades used for cutting down trees up to about 8 inches in diameter, and some with special equipment for pushing large trees onto the fires, also miscellaneous trucks, air compressors, fire pumps, hose, etc.

Contract 64.—Contract 64, a PWA contract, with the Platt Contracting Company Inc., for constructing the service buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre, was continued to completion October 25. A small amount of excavation and erection had been completed at the beginning of the year. Concrete for the septic tank for the building at Shaft 1 was poured December 27. The well for water supply was completed January 25. After the winter shutdown, the contractor resumed work April 5. The building walls of ashlar masonry and brick backing were commenced April 11 and completed June 19. Structural steel was erected April 21 to June 1. Roof framing was completed June 16; metal furring, lathing, plastering of ceilings, July 12; slate roofing, July 27; reinforced concrete floors, July 24; partitions and tile work for toilets, August 17. All work including the installation of fixtures, heating and ventilating, plumbing, electrical work, etc., was substantially completed October 25. Final inspection of the steam boiler was made September 28.

Foundations for the building at Shaft 8 were poured December 16, 1938, followed by backfilling and rough grading after which the work was shut down for the winter and resumed April 3. Structural steel was erected from April 28 to June 21. The building walls of ashlar masonry and brick backing were commenced May 12 and completed June 27. Roof framing was completed July 6; metal furring, lathing, plastering of ceilings, July 24; slate roofing, August 8; partitions and tile work for toilets, August 15. All work including the installation of fixtures, heating and ventilating, plumbing, electrical work, flagpoles, etc., was substantially completed October 25.

The amount of the final estimate dated November 22, was $82,511.51. The contractor's force averaged 12 men for 39 intermittent weeks, the maximum being 25 men for the week ending June 17.

Contract 65.—Contract 65, with the Engineering Service & Construction Co., for installing shaft caps and aqueduct control valves in the Wachusett outlet building at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston, was continued to completion June 9. During this period the Commission continued to operate its 900-horsepower motor-driven tunnel unwatering pump. The upper orifice of the shaft was capped December 30, 1938. The large conduit pipe from the lower orifice was installed January 24, encased in concrete January 31 and lined with gunite February 3. The structural steel operating platform was placed from January 12 to January 21. The shaft was capped February 24. The 24-inch valve at the breaking plate on the upper orifice cap was installed June 9.

The amount of the final estimate dated June 27 was $12,644.72, all of which has been paid. The contractor's force averaged three men.

Contract 66.—Contract 66, a PWA contract, with C. & R. Construction Company, for constructing regulating dams on the Middle and East branches of the Swift River in the towns of New Salem, Hardwick and Petersham, was continued throughout the year. Excavation at the East Branch site was started April 14. The placing of the pervious, impervious and selected coarse material was carried along together and the paving, screened gravel and riprap followed as the slopes were prepared. The earth embankment was started May 12 and completed October 5. Forms for the concrete spillway were started June 6. Concrete was first poured June 12 and completed September 7. Meanwhile the river was diverted through an excavated channel just east of the concrete structure. Gravel road surfacing, soil dressing and seeding were completed October 10.

Excavation at the Middle Branch site was started June 6. The earth embankment was started July 6, and completed November 23. Forms for the spillway were started July 5. Concrete was first poured July 18 and completed October 16. Transit mixed concrete was used for the footings and then discontinued in favor of a six-bag mixer at the site. Meanwhile Red Brook, in the bed of which the spillway was constructed, was diverted through an excavated channel to the Middle Branch. The flow was then reversed and taken entirely through the permanent draw-down pipe in the spillway structure while the main earth embankment across the Middle Branch was constructed. Gravel road surfacing, soil dressing and seeding were completed November 23. Clearing of the area to be flooded behind the regulating dams was continued and substantially completed during the year.

The value of work included in contract estimates to November 6, the date of the latest estimate, was $164,455.24 of which 90 per cent has been approved for payment. The contractor's force averaged 77 men, the maximum being 151 for the week ending June 17.

The principal items of plant equipment were as follows:

3	Gas shovels with auxiliary booms
1	1½-cubic yard gas shovel
4	Caterpillar-tractor bulldozers
1	Sheep's-foot roller
1	14-ton road roller
	Miscellaneous trucks, air compressors, concrete mixers, pumps, etc.

The total work done and materials furnished to date under the principal items of Contract 66 are as follows:

Clearing	690	acres
Grubbing	60	"
Earth excavation	46,300	cu. yds.
Consolidated pervious embankment	23,200	" "
Rolled impervious embankment	8,680	" "
Crushed stone or screened gravel	2,400	" "
Riprap	4,300	" "
Portland cement	5,470	bbls.
Concrete, Class A	1,230	cu. yds.
Concrete, Class B	1,230	" "
Concrete, Class C	730	" "

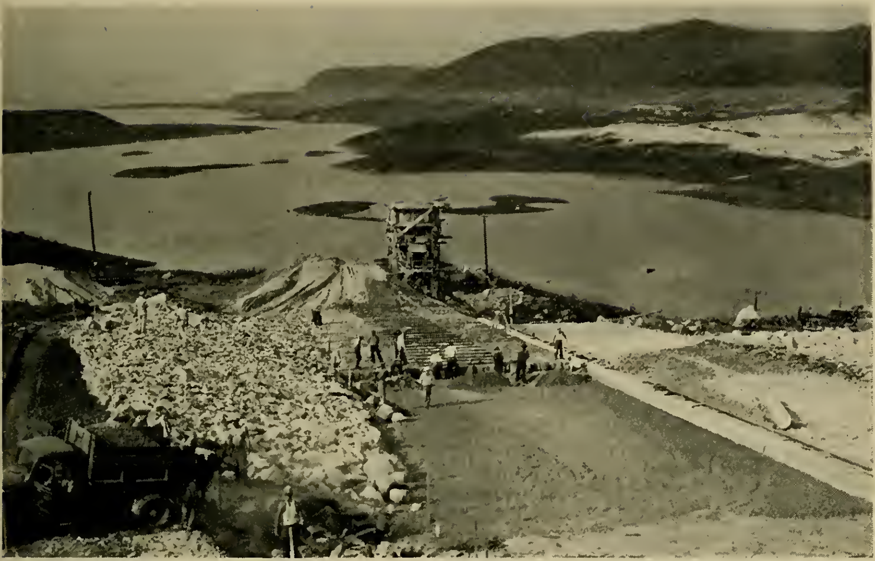
Contract 72.—Contract 72, a PWA contract, with C. & R. Construction Company, for clearing a portion of the site of Quabbin Reservoir on the upper Middle and East branches in the towns of New Salem, Petersham and Hardwick, was continued throughout the year. Work during the year consisted of clearing 8,145 acres, 55 per cent woodland, 35 per cent brushland and 10 per cent open land; grubbing 40 acres; excavating 24,720 cubic yards of earth, and removing 735 cubic yards of excrementitious material and 335 cubic yards of masonry walls and chimneys.

The value of work included in contract estimates to November 2, the date of the latest estimate, was $447,865.50, of which 90 per cent has been approved for payment. The contractor's force averaged 211 men, the maximum being 365 for the week ending June 17.

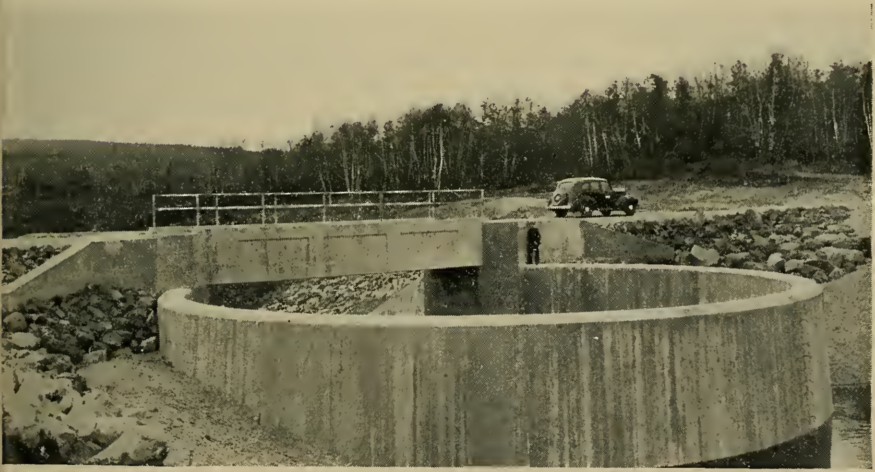
The principal items of plant equipment were as follows:

5	Cranes and shovels ¾ to 1½-cubic yards
6	Caterpillar-tractor bulldozers
	Miscellaneous trucks, fire pumps, hose, etc.

Contract 82.—Bids were opened February 16, for constructing Administration Road in the Town of Ware. This is a PWA contract. Ten bids were received, ranging from $219,060.92 to $388,794.65. The contract was executed March 9 with G. Rotondi & Son, Melrose, Mass., the lowest bidder. The work consists of constructing an access road connecting the Winsor Dam spillway weir road built under Contract 52 with the Quabbin Dike access road built under Contract 36 and includes a parking area near the summit of Quabbin Hill and a traffic circle at the junction of a spur road extending into the hilltop parking area. The main road 3.70 miles in length and the spur road 0.28



Contract 52.—Looking from Patrol Building down Seaplane Ramp to West Branch of Quabbin Reservoir, Showing Area Flooded October 5, 1939.



Contract 66.—Spillway of Shallow Flowage Regulating Dam on Middle Branch, at Upper End of Quabbin Reservoir.

mile are surfaced with bituminous macadam, 24 feet in width, to the parking area; and the road around the parking area, 20 feet in width. About 1.05 miles of the main road were reconstructed along the former Enfield-Ware road.

Clearing and grubbing started March 21 and was completed May 5, and grading started April 5 and was completed October 13. The macadam surface was constructed on a gravel foundation 12 inches thick which was placed July 15 to October 20. Macadam consists of two courses of broken stone, the bottom course 3½ inches bound with sand and the top course 2½ inches penetrated with asphalt at the rate of 2 gallons per square yard, sealed with asphalt at the rate of ⅜ gallon per square yard and bound with ½-inch broken stone. Crushed stone was purchased and trucked from a quarry in Amherst. The macadam surface was completed October 27. At the end of the year the eight strand multiple cable highway guard was partially installed and loaming of slopes partially completed. At various points the contractor's spoil piles were suitably graded to form parking areas. At one of these, where a fine view of Winsor Dam is available, subgrading and loaming were done and curbing installed to accommodate a proposed memorial to Frank E. Winsor, late Chief Engineer of the Commission.

The value of work included in contract estimates to November 21, the date of the latest estimate, was $184,731.32 of which 90 per cent has been approved for payment. The contractor's force averaged 47 for a period of 37 weeks, the maximum being 90 for the week ending September 16.

The principal items of plant were as follows:

5	Power shovels
2	Bulldozers
1	Power grader
2	Rollers
19	Trucks
	Miscellaneous compressors, pumps, etc.

The total work done and materials furnished to date under the principal items of Contract 82 are as follows:

Roadway earth excavation	71,800	cu. yds.
Ledge excavation	17,660	" "
Ordinary borrow	25,000	" "
Plain cement concrete masonry, Class C	770	" "
Reinforced cement concrete masonry, Class B	50	" "
Crushed stone	21,800	tons
Bituminous material	156,000	gals.
Gravel borrow	26,000	cu. yds.
Highway guard	8,200	lin. ft.
Trench excavation	3,150	cu. yds.
Loam borrow	7,500	" "

Contract 88.—Contract 88, with Warner Bros. & Goodwin, Inc., for furnishing and storing top soil at Quabbin Dike and in the Quabbin Park Cemetery in the Town of Ware, was completed May 22. Following the winter lay-off, the work was resumed February 17 and continued to completion except for a shutdown from March 24 to May 16 on account of the wet condition of the borrow area. About 4,595 cubic yards were stored at Quabbin Dike and 6,395 cubic yards at Quabbin Park Cemetery.

The final estimate dated July 28 was for $8,362.27, all of which has been paid.

Contract 93.—Bids were opened October 19, for completing the East Branch Baffle in the towns of Petersham and Hardwick. This is a PWA contract. Nine bids were received, ranging from $28,876.75 to $46,385.50. The contract was executed October 27 with J. J. Callahan, West Roxbury, Mass., the lowest bidder. The work consists of filling a gap left in the original construction under Contract 51 to permit the main north-south highway through the valley to remain as long as possible. Excavation, stripping and scarifying of the existing highway commenced November 6. The embankment, all of which is pervious, was placed with 3 scraper wagons and rolled with a sheep's-foot roller. The gravel used was taken from a borrow pit near the west end of the structure. Screened gravel for bedding the riprap slopes was obtained from the stock pile northeast of the baffle which remained from the operations under Contract 51.

Placing of this material on the finished slopes of pervious embankment began November 23. Riprap was obtained from the required excavations, from stone walls, old quarries and stones in adjacent fields commencing November 21. At the end of the year the contract was approximately 40 per cent complete. The contractor's force averaged 22 men, the maximum being 29 for the week ending November 25.

The value of work included in contract estimates to November 21, the date of the latest estimate was $5,452.75, of which 90 per cent was approved for payment.

The principal items of plant were as follows:

1	Steam shovel
2	8-cubic yard scraper wagons
1	14-cubic yard scraper wagon
3	Bulldozers
1	Sheep's-foot roller
1	Crane with clamshell bucket
	Miscellaneous trucks, etc.

Contract 98.—Bids were opened August 17, for removing the steel bulkhead from the Quabbin Aqueduct Tunnel in the Town of Barre. Three bids were received, ranging from $1,500.00 to $4,500.00. The contract was executed September 22 with Warner Bros. & Goodwin, Inc., Sunderland, Mass., the lowest bidder. The work consists of burning out and removing the bulkhead which was constructed in the Quabbin Aqueduct Tunnel, about 2,200 feet west of Shaft 8, under Contract 17, to prevent any flows westerly in the tunnel pending completion of Quabbin Reservoir. The work was started September 5 and completed October 2. The contractor lowered men, materials and equipment at both Shafts 8 and 9. He used an acetylene torch for burning, and a two-wheel trailer with pneumatic tires for transportation along the tunnel invert.

The amount of the final estimate dated October 20, was $1,500.00, of which $1,350.00 has been paid. The contractor's force averaged 13, working two 8-hour shifts.

LIST OF DRAWINGS AND TABLES APPENDED HERETO

Location of Real Estate Acquired for Quabbin Reservoir.
Takings of Real Estate and Water Rights.
Status of Contracts Completed between November 30, 1938, and November 30, 1939.
Status of Contracts in Force on November 30, 1939.
Canvass of Bids, Contract 74.
Canvass of Bids, Contract 75.
Canvass of Bids, Contract 77.
Canvass of Bids, Contract 78.
Canvass of Bids, Contract 79.
Canvass of Bids, Contract 80.
Canvass of Bids, Contract 81.
Canvass of Bids, Contract 82.
Canvass of Bids, Contract 83.
Canvass of Bids, Contract 85.
Quantities Involved in Contracts for Laying the Pressure Aqueduct Surface Pipe.
Monthly Rainfall at Stations on Ware and Swift Watersheds, 1939.

For data on contracts completed prior to November 30, 1938, see sixth to thirteenth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1939, see 1935 to 1938 annual reports, inclusive.

Respectfully submitted,
KARL R. KENNISON, *Chief Engineer.*

20 SOMERSET STREET, BOSTON, MASS.
January 15, 1939.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

Expenditures and Disbursements for the Fiscal Year and from July 28, 1926, the Date of the Appointment of the Commission

New accounts have been opened during the year necessitating transfers from old accounts.

In the case of accounts marked PWA, the cost to the Commonwealth will be decreased by the amount of the federal grant.

General Overhead

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Administration, *Commissioners' Office*:		
Salaries, Commissioners	$10,500.00	$138,415.56
Salaries, Clerical	14,047.41	156,123.74
General Legal Expense	182.72	2,354.88
Furniture and Fixtures	1,692.14	6,575.74
Engineering Instruments	421.97	519.97
Rental of Equipment	5.00	5.00
Rent and Upkeep	2,166.84	29,750.01
Automobile Purchase	00.00	2,917.93
Automobile Maintenance	258.76	3,856.54
Miscellaneous Expense (undistributed)	3,872.89	23,632.47
Advertising	439.91	12,685.31
Printing and Blueprinting	554.24	12,049.62
Stationery and Office Supplies	370.60	3,911.99
Postage	322.00	2,277.13
Total Administration, Commissioners' Office	$34,834.48	$395,075.89
Engineering, *Headquarters' Office*:		
Salaries, Engineering	$44,983.44	$989,459.61
Salaries, Clerical	15,845.81	134,273.35
General Consultant Expense	109.15	118,277.65
General Legal Expense	00.00	53,160.29
Furniture and Fixtures	339.49	15,521.00
Laboratory Equipment	00.00	1,961.00
Laboratory Supplies	00.00	2,071.94
Rental of Equipment	00.00	3,370.02
Engineering Instruments	375.09	1,641.46
Rent and Upkeep of Boston Office	9,726.92	136,152.84
Rent and Upkeep of Springfield Laboratory	00.00	3,950.54
Automobile Purchase	00.00	3,604.62
Automobile Maintenance	256.74	4,741.14
Special Experiments	00.00	2,304.63
Miscellaneous Expense (undistributed)	801.04	24,395.54
Printing and Blueprinting	269.02	17,177.60
Stationery and Office Supplies	281.07	7,249.67
Postage	605.60	3,310.08
Medical and Surgical Services	5.00	5.00
Total Engineering, Headquarters' Office	$73,598.37	$1,522,627.98

Distribution of General Overhead

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Administration, *Commissioners' Office*:		
Ware Supply, including Wachusett-Coldbrook Tunnel Section (except PWA)	$2,717.08	$89,840.86
Coldbrook-Swift Tunnel Section	69.66	29,870.61
Quabbin Reservoir (except PWA)	25,429.19	179,435.86
Winsor Dam	6,374.74	52,981.22
Quabbin Dike	69.66	28,654.27
Special Investigations	00.00	4,298.45
Southern Sudbury Emergency Supply	00.00	8,690.28
Wachusett Watershed	174.15	1,304.34
Sub Total (not including PWA)	$34,834.48	$395,075.89
Wachusett-Coldbrook Tunnel Section (PWA)	2.45	2.45
Quabbin Reservoir (PWA)	461.34	545.52
Weston Aqueduct Siphons (PWA)	418.57	423.11
Pressure Aqueduct West of Norumbega Reservoir (PWA)	3,374.73	3,397.99
Norumbega Reservoir (PWA)	190.10	190.10
Pressure Aqueduct East of Norumbega Reservoir (PWA)	732.63	732.63
Spot Pond By-pass (PWA)	285.80	285.80
Total Administration, Commissioners' Office	$40,300.10	$400,653.49
Engineering, *Headquarters' Office*:		
Ware Supply, including Wachusett-Coldbrook Tunnel Section (except PWA)	$5,899.29	$346,378.13
Coldbrook-Swift Tunnel Section	146.12	114,124.01
Quabbin Reservoir (except PWA)	53,335.79	721,867.70
Winsor Dam	13,370.48	177,317.14
Quabbin Dike	146.12	106,717.78
Special Investigations	00.00	19,863.79
Southern Sudbury Emergency Supply	00.00	33,407.97
Wachusett Watershed	700.57	2,951.46
Sub Total (not including PWA)	$73,598.37	$1,522,627.98
Wachusett-Coldbrook Tunnel Section (PWA)	589.23	663.59
Quabbin Reservoir (PWA)	4,008.71	5,356.31
Weston Aqueduct Siphons (PWA)	2,480.90	5,066.29
Pressure Aqueduct West of Norumbega Reservoir (PWA)	51,503.01	62,313.77
Norumbega Reservoir (PWA)	8,951.23	9,022.20
Pressure Aqueduct East of Norumbega Reservoir (PWA)	15,612.94	16,041.31
Enlarging Middlesex Fells Reservoir (PWA)	2,940.71	2,940.71
Spot Pond By-pass (PWA)	6,875.38	6,875.38
Charles River Shaft (PWA)	1,047.93	1,047.93
Total Engineering, Headquarters' Office	$167,608.41	$1,631,955.47

WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT, (EXCEPT PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$2,717.08	$89,840.86
Engineering, Headquarters' Office (except WPA Project)	5,698.90	346,177.74
WPA Project, Town of Rutland Sewer	200.39	200.39
Total General Overhead	$8,616.37	$436,218.99
ENGINEERING:		
Salaries, Engineering and Clerical	$5,572.85	$406,931.70
Consultant Expense	857.25	9,335.25
Labor	185.88	4,838.00
Furniture and Fixtures	33.72	2,341.44
Engineering Instruments	6.70	7,734.50
Rent and Upkeep	1,136.58	20,896.11
Automobile Purchase	111.40	11,690.29
Automobile Maintenance	408.45	16,255.08
Contracts for Investigations and Surveys	00.00	18,640.69
Miscellaneous Expense (undistributed)	468.91	10,626.53
Advertising	00.00	6.05
Printing and Blueprinting	25.99	1,244.16
Stationery and Office Supplies	52.86	3,153.02
Postage	12.90	475.16
Medical and Surgical Services	15.55	15.55
Tools and Equipment	21.38	21.38
Total Engineering	$8,910.42	$514,204.91
REAL ESTATE—*General Construction*:		
Legal and Expert Expense	$00.00	$6,205.35
Consultant Expense	00.00	455.66
Labor	5.63	1,716.83
Miscellaneous Expense (undistributed)	00.00	1,003.60
Printing and Blueprinting	13.78	76.14
Purchases and Settlements	750.00	124,097.50
Taxes	00.00	3,682.24
Maintenance of Real Estate	00.00	1,298.18
Police Protection		
Labor	753.75	794.75
Fire Protection		
Equipment, etc.	42.14	1,296.80
Miscellaneous Expense	10.76	11.30
Special Agents	00.00	17,668.55
Total Real Estate	$1,576.06	$158,306.90
WARE WATERSHED (EXCEPT WPA PROJECT)		
Salaries, Engineering and Clerical	$7,650.08	$153,765.51
Legal and Expert Expense	1,916.35	29,769.51
Consultant Expense	00.00	763.70
Labor	1,176.98	20,421.85
Engineering Instruments	29.25	444.90
Rent and Upkeep	241.44	795.95

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Furniture and Fixtures	75.82	139.00
Completed Contracts Nos. 27 and 39	00.00	243,104.18
Automobile Purchase	2,345.07	3,527.60
Automobile Maintenance	1,032.89	7,306.30
Special Experiments	00.00	700.00
Compensation to Labor for Injuries	00.00	774.85
Medical and Surgical Supplies	00.19	200.19
Medical and Surgical Services	15.56	26.56
Miscellaneous Expense (undistributed)	302.53	6,224.22
Printing and Blueprinting	55.98	902.64
Stationery and Office Supplies	75.29	577.61
Advertising	00.00	2.00
Postage	17.43	91.52
Installed Equipment	00.00	5,610.75
Tools and Equipment	80.45	80.45
Rental of Equipment	00.00	2.50
Purchases and Settlements	35,177.70	1,395,902.61
Taxes	3,237.10	56,336.52
Maintenance of Real Estate	671.11	11,500.60
Special Agents		
Salaries	1,740.00	13,908.67
Automobile Purchase	1,148.98	2,627.65
Automobile Maintenance	99.55	2,434.84
Miscellaneous Expense (undistributed)	137.38	1,603.12
Printing and Blueprinting	00.00	167.40
Stationery and Office Supplies	0.92	9.03
Postage	3.00	26.55
Labor	00.00	15.00
Furniture and Fixtures	98.89	98.89
Police Protection		
Labor	525.50	589.50
Fire Protection		
Equipment	42.14	81.23
Labor	7,268.35	7,415.70
Automobile Maintenance	0.00	4.25
Miscellaneous Expense	0.78	1.56
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing State Sanatorium Branch	62.57	596.56
U. S. Vet. Hospital Branch	82.71	665.17
Trunk Sewer, except Branches	254.64	1,759.04
Use of City of Worcester's Sewerage System for disposal of Sewage from Rutland-Holden Sewer	422.98	1,600.54
Reforestation, Watershed Planting		
Trees for Watershed Planting	00.00	1,521.89
Labor	590.00	1,599.19
Fire Stops and Fire Access Roads		
Labor	21,213.13	24,007.56
Miscellaneous Expense (undistributed)	0.50	0.50
Medical and Surgical Services	61.50	61.50
Compensation to Labor for Injuries	56.57	56.57
Other Forestry Work and Hurricane Clearing		
Salaries, Engineering	580.69	580.69
Labor	12,553.84	12,553.84
Tools and Equipment	147.87	147.87
Rental of Equipment	1.00	1.00
Automobile Maintenance	725.21	725.21
Maintenance of Medical Equipment	129.41	129.41

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Medical and Surgical Services	190.50	190.50
Compensation to Labor for Injuries	1,080.00	1,080.00
Miscellaneous Expense (undistributed)	37.00	37.00
Fencing of Watershed Property	120.00	120.00
Sub Total Ware Watershed (except WPA Project)	$103,476.83	$2,015,388.95
WARE WATERSHED PROTECTION (WPA PROJECT) TOWN OF RUTLAND SEWER:		
Salaries, Engineering and Clerical	$37.77	$37.77
Tools and Equipment	594.47	594.47
Rent and Upkeep	13.20	13.20
Miscellaneous Expense (undistributed)	158.02	158.02
Stationery and Office Supplies	4.23	4.23
Postage	0.50	0.50
Sub Total, Town of Rutland Sewer	$808.19	$808.19
Total Ware Watershed	$104,285.02	$2,016,197.14
WARE DIVERSION DAMAGES	$00.00	$1,425,777.62
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$00.00	$9,629,739.99
Contract No. 65, Installing Shaft Caps, etc., Wachusett Outlet Building	12,644.72	12,644.72
Sub Total Construction Contracts	$12,644.72	$9,642,384.71
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Furniture and Fixtures	$121.97	$121.97
Engineering Instruments	12.60	30.00
Installed Equipment	47,217.40	111,800.73
Temporary Equipment	00.00	6,423.60
Labor except Contracts	2,847.21	7,928.24
Compensation to Labor for Injuries	00.00	18.29
Contracts for Equipment for Surveys	00.00	898.34
Maintenance of Partially Completed Structures	8,199.41	23,950.44
Maintenance of Grounds	12.80	5,656.74
Purchases of Plants, Trees and Shrubbery	00.00	842.58
Rental of Equipment	230.00	237.00
Miscellaneous Expense (undistributed)	589.94	10,519.07
Printing and Blueprinting	28.10	79.64
Stationery and Office Supplies	2.98	4.69
Materials of Construction	00.00	25.87
Automobile Maintenance	4.06	4.06
Sub Total Except Construction Contracts	$59,266.47	$168,541.26
Total Permanent Construction (Except PWA)	$71,911.19	$9,810,925.97
Total Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (Except PWA)	$195,299.06	$14,361,631.53

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$2.45	$2.45
Engineering, Headquarters' Office	589.23	663.59
Total General Overhead	$591.68	$666.04
ENGINEERING:		
Salaries, Engineering and Clerical	$5,506.84	$6,178.56
Consultant Expense	360.11	392.59
Labor	19.38	19.38
Rent and Upkeep	94.87	94.87
Furniture and Fixtures	27.32	27.32
Automobile Maintenance	62.69	62.69
Miscellaneous Expense (undistributed)	16.20	16.20
Printing and Blueprinting	52.34	52.34
Stationery and Office Supplies	0.05	0.05
Postage	1.45	1.45
Total Engineering	$6,141.25	$6,845.45
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 64, Service Buildings, Shafts 1 and 8	$74,260.36	$74,260.36
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Miscellaneous Expense (undistributed)	$1.56	$1.56
Materials of Construction	68.60	68.60
Sub Total Except Construction Contracts	$70.16	$70.16
Total Permanent Construction (PWA Only)	$74,330.52	$74,330.52
Total Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (PWA Only)	$81,063.45	$81,842.01
TOTAL WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT	$276,362.51	$14,443,473.54
COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$69.66	$29,870.61
Engineering, Headquarters' Office	146.12	114,124.01
Total General Overhead	$215.78	$143,994.62
ENGINEERING:		
Salaries, Engineering and Clerical	$427.97	$269,287.05
Consultant Expense	83.52	670.25
Labor	251.54	2,942.34
Furniture and Fixtures	14.06	1,581.46
Engineering Instruments	00.00	4,577.18
Rent and Upkeep	32.26	10,858.79
Rental of Equipment	00.00	3.00
Automobile Purchase	13.92	7,727.13
Automobile Maintenance	95.31	18,240.90

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Contracts for Investigations and Surveys	00.00	13,525.66
Materials of Construction	00.00	2.25
Miscellaneous Expense (undistributed)	204.47	8,330.05
Printing and Blueprinting	2.29	962.24
Stationery and Office Supplies	4.72	2,210.75
Postage	1.58	531.03
Medical and Surgical Services	00.00	13.00
Total Engineering	$1,131.64	$341,463.08
REAL ESTATE—GENERAL CONSTRUCTION:	$00.00	$27,831.86
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$00.00	$4,839,203.43
Contract No. 98, Removing Steel Bulkhead, Quabbin Aqueduct	1,350.00	1,350.00
Sub Total Construction Contracts	$1,350.00	$4,840,553.43
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$813.29	$1,258.74
Installed Equipment	369.46	25,261.72
Water Supply System	00.00	3,417.56
Miscellaneous Expense (undistributed)	00.00	2,590.91
Advertising	18.00	18.00
Sub Total Except Construction Contracts	$1,200.75	$32,546.93
Total Permanent Construction	$2,550.75	$4,873,100.36
COLDBROOK-SWIFT DAMAGES—EXCEPT AWARDS BY COURT DECREE:	$00.00	$3,800.00
COLDBROOK-SWIFT DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries Engineering and Clerical	$00.00	$30.90
Legal Expense	93.20	1,647.03
Expert and Other Witness Expense	145.00	241.50
Payments under Certificates of Judgment	2,650.00	2,650.00
Sub Total Coldbrook-Swift Damages—Awards by Court Decree—Jury Verdicts	$2,888.20	$4,569.43
Total Coldbrook-Swift Damages	$2,888.20	$8,369.43
TOTAL COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT	$6,786.37	$5,394,759.35

QUABBIN RESERVOIR (PWA ONLY)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$461.34	$545.52
Engineering, Headquarters' Office	4,008.71	5,356.31
Total General Overhead	$4,470.05	$5,901.83
QUABBIN RESERVOIR CLEARING—ENGINEERING:		
Salaries, Engineering and Clerical	$33,261.88	$38,523.31
Consultant Expense	00.00	64.03
Labor	4,314.40	4,314.40
Furniture and Fixtures	100.82	100.82

	Year ending Nov. 30. 1939	Total to Nov. 30, 1939
Engineering Instruments	423.82	423.82
Rent and Upkeep	51.42	51.42
Medical and Surgical Services	11.00	11.00
Automobile Purchase	2,686.66	2,686.66
Automobile Maintenance	1,682.34	1,682.34
Miscellaneous Expense (undistributed)	1,283.21	1,283.21
Printing and Blueprinting	110.37	110.37
Stationery and Office Supplies	8.86	8.86
Total Quabbin Reservoir Clearing—(PWA Only)—Engineering	$43,934.78	$49,260.24
Administration Road—Quabbin Hill—Engineering:		
Salaries, Engineering and Clerical	$17,701.51	$21,407.32
Consultant Expense	19.40	19.40
Labor	80.00	282.50
Testing Materials	829.33	829.33
Tools and Equipment	8.31	8.31
Automobile Maintenance	278.52	278.52
Miscellaneous Expense (undistributed)	212.69	212.69
Printing and Blueprinting	100.30	100.30
Advertising	13.20	13.20
Total Administration Road—Engineering	$19,243.26	$23,151.57
Regulating Dams—Engineering:		
Salaries, Engineering and Clerical	$12,982.83	$14,097.15
Labor	2,758.12	2,758.12
Testing Materials	176.65	176.65
Furniture and Fixtures	58.13	58.13
Engineering Instruments	55.93	55.93
Rent and Upkeep	304.96	304.96
Automobile Purchase	1,595.90	1,595.90
Automobile Maintenance	448.35	448.35
Miscellaneous Expense (undistributed)	194.26	194.26
Printing and Blueprinting	99.38	99.38
Total Regulating Dams—Engineering	$18,674.51	$19,788.83
Completion of East Branch Baffle—Engineering:		
Salaries, Engineering and Clerical	$586.87	$586.87
Labor	98.75	98.75
Printing and Blueprinting	16.39	16.39
Stationery and Office Supplies	35.99	35.99
Total Completion of East Branch Baffle—Engineering	$738.00	$738.00
Permanent Construction—Construction Contracts:		
Contract No. 61, Clearing West Branch	$265,883.46	$265,883.46
Contract No. 62, Clearing Lower Middle and East Branches	341,304.14	341,304.14
Contract No. 63, Clearing Central Portion Middle Branch	205,661.67	205,661.67
Contract No. 66, Regulating Dams	148,009.72	148,009.72

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Contract No. 72, Clearing Upper Middle and East Branches	403,078.95	403,078.95
Contract No. 82, Quabbin Hill Road	166,258.19	166,258.19
Contract No. 93, Completion of East Branch Baffle	4,907.47	4,907.47
Total Permanent Construction (PWA Only)	$1,535,103.60	$1,535,103.60
Total Quabbin Reservoir (PWA Only)	$1,622,164.20	$1,633,944.07

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$25,429.19	$179,435.86
Engineering, Headquarters' Office	53,335.79	721,867.70
Total General Overhead	$78,764.98	$901,303.56
ENGINEERING:		
Salaries, Engineering and Clerical	$45,165.86	$615,118.27
Consultant Expense	2,491.55	6,743.73
Labor	24,926.17	59,476.76
Legal Expense	00.00	4.06
Compensation to Labor for Injuries	00.00	52.63
Furniture and Fixtures	5,990.19	9,222.40
Laboratory Equipment	1,056.22	3,442.71
Laboratory Supplies	1,250.20	5,746.88
Rental of Equipment	00.00	16.75
Engineering Instruments	333.17	6,808.28
Tools and Equipment	655.50	655.50
Rent and Upkeep	8,019.92	23,823.00
Medical and Surgical Supplies	14.69	26.10
Medical and Surgical Services	50.25	141.75
Automobile Purchase	3,685.72	26,761.24
Automobile Maintenance	11,249.38	40,330.59
Special Experiments	00.00	422.80
Contracts for Investigations and Surveys	00.00	14,683.87
Office Buildings	00.00	5,059.20
Miscellaneous Expense (undistributed)	3,601.97	14,568.24
Printing and Blueprinting	241.57	3,681.96
Stationery and Office Supplies	878.60	8,823.16
Postage	283.14	2,255.22
Labor on Automobiles and Mechanical Equipment	145.00	145.00
Maintenance of Mechanical Equipment	428.25	428.25
Maintenance of Grounds	132.54	132.54
Purchase and Planting of Trees and Shrubbery	1,740.79	1,740.79
Total Engineering	$112,340.68	$850,311.68
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:		
Legal and Expert Expense	$4,223.29	$187,066.44
Consultant Expense	00.00	146.78
Labor	7,008.96	26,617.93
Compensation to Labor for Injuries	38.57	152.00
Furniture and Fixtures	00.00	46.06
Medical and Surgical Services	15.00	100.00
Automobile Maintenance	53.14	820.65

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Miscellaneous Expense (undistributed)	564.03	10,731.35
Advertising	00.00	208.66
Printing and Blueprinting	15.77	1,667.69
Purchases and Settlements	323,534.00	7,265,041.27
Purchase price B. & A. R. R. and N. Y. C. lessee, for part of Athol Branch and general release of all claims for damages for reservoir construction	00.00	641,240.88*
Taxes	7,282.24	476,928.71
Maintenance of Real Estate	4,230.77	15,531.92
Water Supply System	00.00	48.60
Remodelling of Real Estate for Permanent Occupancy	4,923.63	4,923.63
Labor on Automobiles and Mechanical Equipment	145.00	145.00
Fire Protection		
Salaries, Engineering	981.57	981.57
Equipment	5,174.94	10,796.94
Automobile Purchase	2,816.00	3,587.69
Automobile Maintenance	881.35	1,306.61
Labor	27,174.26	34,217.64
Medical and Surgical Services	83.25	103.25
Compensation to Labor for Injuries	59.14	69.14
Miscellaneous Expense	619.14	915.69
Rental of Equipment	30.00	30.00
Police Protection		
Salaries	94.56	94.56
Automobile Maintenance	24.56	24.56
Labor	27,242.94	30,697.99
Medical and Surgical Services	21.00	21.00
Special Agents		
Salaries	2,495.84	27,961.84
Equipment	00.00	118.33
Labor	00.00	30.00
Automobile Purchase	—370.00	1,870.63
Automobile Maintenance	210.46	4,540.79
Miscellaneous Expense (undistributed)	233.55	2,024.13
Printing and Blueprinting	00.00	52.72
Stationery and Office Supplies	16.42	39.54
Postage	7.90	26.47
Renting Agents		
Salaries	2,382.42	31,790.52
Legal Expense	740.29	1,910.86
Furniture and Fixtures	00.00	29.29
Automobile Purchase	00.00	906.61
Automobile Maintenance	346.26	930.77
Labor	00.00	69.50
Miscellaneous Expense (undistributed)	282.42	1,308.48
Printing and Blueprinting	00.00	18.62
Stationery and Office Supplies	00.00	47.04
Postage	15.03	300.72
Payments to Towns	00.00	20,500.00
Sub Total Real Estate—Except Awards by Court Decree	$423,597.70	$8,808,741.07

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* Includes interest on settlement of $575,000.00, which settlement was approved and scheduled by Commission on March 29, 1935, and shown in 1935 expenditures although payment was disapproved by Governor and Council and warrant returned to Comptroller's bureau. Rescheduled by Commission with interest on March 4, 1937, in accordance with judgment received from Superior Court, February 15, 1937.

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Salaries of Referees	$3,000.00	$24,140.00
Salaries, Engineering and Clerical	202.95	1,658.11
Legal Expense	6,764.32	21,118.54
Consultant and Engineering Expert Expense	00.00	2,545.50
Expert and Other Witness Expense	657.50	22,822.90
Automobile Maintenance	2.25	8.78
Expenses of Board of Referees	24.40	788.70
Miscellaneous Expense	23.02	614.93
Printing and Blueprinting	00.00	21.99
Stationery and Office Supplies	00.00	23.72
Payments Under Certificates of Judgment	23,833.00	202,874.67
Sub Total Real Estate—Awards by Court Decree—Board of Referees	$34,507.44	$276,617.84
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	$105.83	$133.56
Legal Expense	2,733.55	3,794.55
Miscellaneous Expense	7.13	44.13
Payments under Certificates of Judgment	00.00	20,878.65
Expert and Other Witness Expense	200.00	204.80
Consultant Expense	1,101.09	1,101.09
Sub Total Real Estate—Awards by Court Decree—Jury Verdicts	$4,147.60	$26,156.78
Total Real Estate	462,252.74	$9,111,515.69
QUABBIN RESERVOIR DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering	$00.00	$87.68
Legal and Expert Expense	00.00	931.00
Consultant Expense	00.00	2,158.82
Miscellaneous Expense (undistributed)	00.00	15.19
Printing and Blueprinting	00.00	2.96
Purchases and Settlements	9,265.00	57,946.00
Sub Total Quabbin Reservoir Damages—Except Awards by Court Decree	$9,265.00	$61,141.65
QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Legal Expense	$2,339.65	$2,540.54
Expert and Other Witness Expense	900.00	940.00
Payments under Certificates of Judgment	1,655.44	1,655.44
Sub Total Quabbin Reservoir Damages—Awards by Court Decree—Board of Referees	$4,895.09	$5,135.98
Total Quabbin Reservoir Damages	$14,160.09	$66,277.63
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering and Clerical	$18,258.17	$110,642.46
Legal and Expert Expense	136.29	5,951.09
Consultant Expense	5,846.82	77,047.73
Labor	7,260.35	9,346.82

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Medical and Surgical Supplies	00.00	2.20
Medical and Surgical Services	2.25	2.25
Furniture and Fixtures	192.52	270.70
Laboratory Equipment	2,906.08	5,105.98
Laboratory Supplies	3,498.52	7,436.98
Engineering Instruments	7.44	770.42
Rent and Upkeep	246.12	1,075.54
Rental of Equipment	00.00	10.50
Automobile Purchase	00.00	1,538.22
Automobile Maintenance	564.32	5,060.14
Contracts for Investigations and Surveys	00.00	569.47
Materials of Construction	00.00	18.99
Miscellaneous Expense (undistributed)	1,940.76	8,189.07
Printing and Blueprinting	351.95	1,437.43
Stationery and Office Supplies	54.87	140.55
Purchases and Settlements	00.00	1,225,650.00
Sub Total Swift Diversion Damages—Except Awards by Court Decree	$41,266.46	$1,460,266.54
BEAVER BROOK DIVERSION DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:	$00.00	$23,418.90
Total Swift Diversion Damages (including Beaver Brook)	$41,266.46	$1,483,685.44
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, TOWN OBLIGATIONS:		
Town of Enfield	$6,039.53	$12,361.96
Town of Greenwich	3,560.85	7,184.85
Town of Prescott	1,627.76	3,358.05
Town of Dana	6,839.51	14,341.76
Sub Total, Town Obligations	$18,067.65	$37,246.62
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, LIQUIDATING EXPENSES:		
Salaries, Engineering	$621.82	$1,123.57
Legal and Expert Expense	1,188.20	1,920.86
Labor	328.00	1,232.49
Miscellaneous Expense	4.44	59.94
Automobile Maintenance	0.78	50.20
Compensation to Labor for Injuries	29.85	29.85
Sub Total, Liquidating Expenses	$2,173.09	$4,416.91
Total, Quabbin Reservoir, Liquidation of Towns	$20,240.74	$41,663.53
QUABBIN RESERVOIR—CEMETERIES—QUABBIN PARK CEMETERY CONSTRUCTION:		
Salaries, Engineering and Clerical	$453.11	$14,227.78
Legal and Expert Expense	00.00	520.00
Consultant Expense	45.97	320.52
Labor	9,823.13	44,702.33
Tools and Equipment	238.58	741.27
Automobile Purchase	00.00	4,192.88
Automobile Maintenance	146.37	3,147.28
Rental of Equipment	00.00	33.19

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Purchases and Settlements	00.00	8,850.00
Construction Materials	257.94	3,242.77
Purchase and Planting of Trees and Shrubbery	00.00	218.93
Receiving Vault	00.00	2,768.85
Water Supply System	207.26	1,459.23
Maintenance of Grounds	6,048.61	21,818.92
Miscellaneous Expense (undistributed)	339.77	2,014.92
Printing and Blueprinting	44.18	232.48
Stationery and Office Supplies	34.79	61.99
Medical and Surgical Services	13.00	21.00
Completed Contract No. 34	00.00	7,842.94
Compensation to Labor for Injuries	00.00	69.27
Sub Total Quabbin Park Cemetery Construction	$17,652.71	$116,486.55
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:		
Salaries, Engineering and Clerical	$3,481.66	$20,158.10
Tools and Equipment	00.00	684.63
Automobile Purchase	00.00	2,669.99
Automobile Maintenance	59.22	2,488.07
Removal and Reinterment of Bodies	4,309.37	30,791.57
Removal and Resetting of Monuments	1,985.98	18,003.58
Miscellaneous Expense	00.00	6.75
Rental of Equipment	00.00	10.50
Sub Total Removals to Quabbin Park Cemetery	$9,836.23	$74,813.19
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUABBIN PARK:		
Salaries, Engineering and Clerical	$437.71	$7,009.94
Tools and Equipment	00.00	15.43
Automobile Purchase	00.00	380.00
Automobile Maintenance	00.00	155.73
Purchases and Settlements	315.00	8,156.60
Perpetual Care Fund Contributions	00.00	175.00
Removal and Reinterment of Bodies	533.41	8,046.68
Removal and Resetting of Monuments	178.75	6,583.16
Miscellaneous Expense	00.00	123.51
Sub Total Removals to Other Cemeteries	$1,464.87	$30,646.05
Total Quabbin Reservoir-Cemeteries	$28,953.81	$221,945.79
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS		
Contract No. 47, Construction of Service Building at Shaft 12	$500.00	$16,179.76
Completed Contracts	00.00	85,480.97
Contract No. 51, Construction of East Branch Baffle	8,861.02	198,407.01
Contract No. 56, Construction of Administration Buildings at Main Dam	25,672.14	382,118.09
Contract No. 60, Access Road to Shaft No. 12	15,479.44	73,965.29
Contract No. 88, Storing Top Soil	8,362.27	8,362.27
Sub Total Construction Contracts (Except PWA)	$58,874.87	$764,513.39

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:		
Salaries, Engineering	$00.00	$3,206.50
Legal Expense	00.00	3,831.51
Consultant and Engineering Expert Expense	00.00	5,757.65
Miscellaneous Expense (undistributed)	00.00	314.98
Printing and Blueprinting	120.88	120.88
Payment under Certificate of Judgment	9,079.08	9,079.08
Sub Total Awards by Court Decree—Actions for Breach of Contract	$9,199.96	$22,310.60
OTHER PERMANENT CONSTRUCTION—EXCEPT CLEARING		
Salaries Engineering	$44.63	$44.63
Labor	2,135.18	4,392.69
Installed Equipment	636.96	4,454.35
Tools and Equipment	14.11	14.11
Engineering Instruments	12.20	12.20
Materials of Construction	00.00	293.00
Furniture and Fixtures	00.00	34.90
Automobile Maintenance	500.20	502.45
Compensation to Labor for Injuries	00.00	279.74
Medical and Surgical Services	5.50	60.00
Miscellaneous Expense (undistributed)	24.80	1,431.98
Printing and Blueprinting	30.14	56.92
Sub Total Other Permanent Construction—Except Clearing	$3,403.72	$11,576.97
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:		
Tools and Equipment	$00.00	$22,772.12
Labor	00.00	1,721,299.70
Compensation to Labor for Injuries	4,728.71	42,381.67
Miscellaneous Expense (undistributed)	00.00	2,749.64
Printing and Blueprinting	00.00	69.76
Stationery and Office Supplies	00.00	1,029.84
Postage	00.00	186.71
Automobile Purchase	—285.05	11,449.17
Automobile Maintenance	00.00	5,404.67
Furniture and Fixtures	00.00	877.65
Rent and Upkeep	00.00	826.98
Medical and Surgical Equipment	126.90	299.72
Medical and Surgical Supplies	00.00	2,023.67
Medical and Surgical Services	247.00	14,320.13
Fire Protection		
Equipment	00.00	425.87
Miscellaneous Expense	00.00	132.72
Labor	00.00	4,175.00
Legal Expense	947.49	6,617.32
Sub Total 1936 Clearing Project	$5,638.15	$1,837,042.34
OTHER PERMANENT CONSTRUCTION—RESERVOIR CLEARING NOT INCLUDING 1936 CLEARING PROJECT:		
Salaries, Engineering	$773.63	$773.63
Labor	32,752.85	71,476.92

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Miscellaneous Expense (undistributed)	49.48	267.56
Printing and Blueprinting	22.97	62.08
Stationery and Office Supplies	00.00	111.45
Advertising	00.00	261.41
Medical and Surgical Services	131.50	277.50
Tools and Equipment	507.64	652.37
Automobile Purchase	00.00	776.44
Automobile Maintenance	173.19	266.66
Compensation to Labor for Injuries	372.32	372.32
Sub Total Reservoir Clearing (Except PWA) Not Including 1936 Clearing Project	$34,783.58	$75,298.34
Total Quabbin Reservoir Permanent Construction	$111,900.28	$2,710,741.64

HIGHWAY AND PUBLIC UTILITY RELOCATION:

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Salaries, Engineering and Clerical	$160.49	$218,860.76
Legal and Expert Expense	00.00	49.10
Consultant Expense	00.00	9,117.56
Labor	5,623.00	18,314.52
Tools and Equipment	3,097.78	3,097.78
Furniture and Fixtures	00.00	61.74
Completed Contracts	00.00	1,106,394.17
Installed Equipment	00.00	811.57
Temporary Equipment	00.00	149.50
Engineering Instruments	00.00	948.75
Automobile Purchase	00.00	535.00
Automobile Maintenance	54.92	6,178.26
Miscellaneous Expense (undistributed)	54.46	8,706.00
Printing and Blueprinting	00.00	690.48
Stationery and Office Supplies	00.00	159.13
Maintenance of Real Estate	00.00	551.60
Maintenance of Mechanical Equipment	54.24	54.24
Medical and Surgical Services	28.00	28.00
Compensation to Labor for Injuries	23.14	23.14
Total Highway and Public Utility Relocation	$9,096.03	$1,374,731.30

QUABBIN RESERVOIR WATERSHED—REFORESTATION, NURSERIES:

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Salaries, Engineering	$984.43	$4,307.82
Labor	17,597.35	48,146.94
Tools and Equipment	55.91	3,902.15
Automobile Purchase	00.00	174.50
Automobile Maintenance	27.73	1,169.57
Nursery Stock	00.00	2,622.85
Nursery Supplies	1,349.65	4,108.09
Miscellaneous Expense	133.79	276.60
Medical and Surgical Services	11.00	42.00
Compensation to Labor for Injuries	00.00	27.86
Maintenance of Mechanical Equipment	19.55	19.55
Sub Total Reforestation, Nurseries	$20,179.41	$64,797.93

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
QUABBIN RESERVOIR WATERSHED—REFORESTATION, WATERSHED PLANTING:		
Salaries, Engineering	$353.02	$1,637.53
Labor	6,795.29	24,048.64
Tools and Equipment	00.00	262.81
Automobile Maintenance	00.00	193.69
Trees for Watershed Planting	00.00	1,713.00
Nursery Supplies	00.00	1,402.86
Miscellaneous Expense	9.25	73.10
Medical and Surgical Services	6.50	145.50
Compensation to Labor for Injuries	00.00	111.44
Sub Total Reforestation, Watershed Planting	$7,164.06	$29,588.57
QUABBIN RESERVOIR WATERSHED—REFORESTATION, FIRE STOPS AND FIRE ACCESS ROADS:		
Salaries, Engineering	$905.59	$2,306.34
Legal and Expert Expense	15.00	96.24
Labor	16,372.81	38,716.82
Compensation to Labor for Injuries	1,747.22	2,555.16
Medical and Surgical Equipment	7.00	7.00
Medical and Surgical Services	377.50	744.50
Completed Contract No. 60, Access Road, Shaft 12	2,666.04	7,660.00
Automobile Purchase	00.00	500.00
Automobile Maintenance	366.86	976.86
Miscellaneous Expense (undistributed)	17.95	543.13
Printing and Blueprinting	0.24	12.45
Sub Total Reforestation, Fire Stops and Fire Access Roads	$22,476.21	$54,118.50
QUABBIN RESERVOIR WATERSHED—FENCING OF WATERSHED PROPERTY:		
Salaries, Engineering	$59.29	$59.29
Labor	1,328.77	3,066.43
Automobile Maintenance	00.00	74.82
Miscellaneous Expense	1,698.00	1,818.43
Sub Total, Fencing of Watershed Property	$3,086.06	$5,018.97
QUABBIN RESERVOIR WATERSHED—OTHER FORESTRY AND HURRICANE CLEARING:		
Salaries, Engineering and Clerical	$918.95	$918.95
Labor	37,273.91	37,273.91
Compensation to Labor for Injuries	370.28	370.28
Medical and Surgical Services	311.50	311.50
Tools and Equipment	4,265.65	4,265.65
Automobile Maintenance	764.93	764.93
Maintenance of Mechanical Equipment	568.41	568.41
Miscellaneous Expense	135.63	135.63
Sub Total Other Forestry and Hurricane Clearing	$44,609.26	$44,609.26
Total Quabbin Reservoir Watershed	$97,515.00	$198,133.23

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Total Quabbin Reservoir, not including Winsor Dam and Quabbin Dike (Except PWA)	$976,490.81	$16,960,309.39
TOTAL QUABBIN RESERVOIR, NOT INCLUDING WINSOR DAM AND QUABBIN DIKE	$2,598,655.01	$18,594,253.56

WINSOR DAM

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$6,374.74	$52,981.22
Engineering, Headquarters' Office	13,370.48	177,317.14
Total General Overhead	$19,745.22	$230,298.36
ENGINEERING:		
Salaries, Engineering and Clerical	$63,600.76	$342,973.25
Legal and Expert Expense	00.00	35.20
Consultant Expense	538.29	6,379.00
Labor	14,552.93	56,852.57
Furniture and Fixtures	00.00	228.60
Laboratory Equipment	222.52	945.51
Rental of Equipment	00.00	1,202.25
Engineering Instruments	163.50	945.85
Rent and Upkeep	113.13	1,629.14
Automobile Purchase	551.48	3,509.48
Automobile Maintenance	1,118.49	8,558.85
Contracts for Investigations and Surveys	00.00	61,895.52
Office Buildings	00.00	578.39
Special Experiments	00.00	1,853.29
Water Supply System	00.00	20.00
Compensation to Labor for Injuries	00.00	43.78
Medical and Surgical Services	8.50	77.00
Miscellaneous Expense (undistributed)	433.68	13,395.31
Printing and Blueprinting	290.25	2,368.74
Stationery and Office Supplies	87.17	1,516.44
Postage	27.94	199.27
Laboratory Supplies	610.25	838.34
Total Engineering	$82,318.89	$506,045.78
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$00.00	$2,411,543.40
Contract No. 52, Constructing Embankment of Winsor Dam	523,328.42	1,984,818.22
Sub Total Construction Contracts	$523,328.42	$4,396,361.62
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$56.92	$6,182.17
Installed Equipment	23,593.82	43,871.29
Temporary Equipment	00.00	4,213.39
Miscellaneous Expense	550.31	13,252.01
Tools and Equipment	00.00	133.30
Materials of Construction	1,042.95	1,042.95
Sub Total Except Construction Contracts	$25,244.00	$68,695.11
Total Permanent Construction	$548,572.42	$4,465,056.73
TOTAL WINSOR DAM	$650,636.53	$5,201,400.87

QUABBIN DIKE

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office .	$69.66	$28,654.27
Engineering, Headquarters' Office . .	146.12	106,717.78
Total General Overhead . . .	$215.78	$135,372.05
ENGINEERING:		
Salaries, Engineering and Clerical . .	$373.46	$175,456.09
Consultant Expense	123.00	5,785.78
Labor	4,622.35	38,450.60
Furniture and Fixtures	00.00	149.77
Laboratory Equipment	00.00	584.95
Rental and Equipment	00.00	921.50
Engineering Instruments	00.00	155.65
Rent and Upkeep	00.00	73.68
Automobile Purchase	139.92	739.92
Medical and Surgical Services . . .	00.00	7.50
Automobile Maintenance	97.07	3,604.85
Contracts for Investigations and Surveys .	00.00	24,773.32
Special Experiments	00.00	305.20
Miscellaneous Expense (undistributed) .	14.33	5,061.27
Printing and Blueprinting . . .	00.00	1,348.63
Stationery and Office Supplies . .	2.87	209.78
Advertising	00.00	79.34
Postage	00.00	00.30
Laboratory Supplies	23.34	269.06
Maintenance of Grounds	00.00	81.47
Total Engineering	$5,396.34	$258,058.66
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:	$00.00	$2,455,889.88
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	$15.00	$15,157.48
Temporary Equipment	00.00	1,993.18
Tools and Equipment	00.00	148.00
Installed Equipment	00.00	235.00
Miscellaneous Expense	00.00	1,804.76
Maintenance of Grounds	283.61	283.61
Sub Total Except Construction Contracts	$298.61	$19,622.03
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:		
Salaries, Engineering and Clerical . .	$767.74	$767.74
Legal Expense	1,203.60	1,203.60
Consultant and Engineering Expert Expense	227.38	227.38
Expert and Other Witness Expense . .	462.63	462.63
Labor	2.50	2.50

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Automobile Maintenance	25.47	25.47
Miscellaneous Expense	36.55	36.55
Sub Total Awards by Court Decree—Actions for Breach of Contract	$2,725.87	$2,725.87
Total Permanent Construction	$3,024.48	$2,478,237.78
TOTAL QUABBIN DIKE	$8,636.60	$2,871,668.49

Special Investigations

Total Expenditure	$00.00	$149,609.63

Southern Sudbury Emergency Supply

Total Expenditure	$00.00	$638,533.83

Wachusett Watershed—Elimination of Pollution (Except WPA Project)

General Overhead:		
Administration, Commissioners' Office	$174.15	$1,304.34
Engineering, Headquarters' Office	365.33	2,616.22
Total General Overhead	$539.48	$3,920.56
Engineering:		
Salaries, Engineering and Clerical	$4,236.53	$17,456.42
Legal Expense	62.82	234.29
Labor	90.00	1,409.61
Engineering Instruments	14.02	23.02
Automobile Purchase	2,580.75	2,580.75
Automobile Maintenance	265.63	748.63
Furniture and Fixtures	12.88	12.88
Miscellaneous Expense (undistributed)	449.53	974.37
Printing and Blueprinting	60.43	115.43
Stationery and Office Supplies	21.76	40.62
Postage	3.06	15.80
Rent and Upkeep	100.28	146.30
Medical and Surgical Services	535.20	741.20
Settlement of Public Liability Claims	9,655.00	9,655.00
Settlement of Property Damage Claims	92.50	92.50
Total Engineering	$18,180.39	$34,246.82
TOTAL WACHUSETT WATERSHED—ELIMINATION OF POLLUTION (Except WPA Project)	$18,719.87	$38,167.38

Wachusett Watershed—Elimination of Pollution (WPA Project) Town of Holden Sewer

General Overhead:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	335.24	335.24
Total General Overhead	$335.24	$335.24
Engineering:		
Salaries, Engineering and Clerical	$2,529.49	$2,529.49
Labor	667.45	667.45

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Furniture and Fixtures	24.48	24.48
Engineering Instruments	19.71	19.71
Tools and Equipment	4,328.57	4,328.57
Rent and Upkeep	92.60	92.60
Automobile Purchase	150.00	150.00
Automobile Maintenance	98.74	98.74
Medical and Surgical Supplies	3.07	3.07
Miscellaneous Expense (undistributed)	6,302.01	6,302.01
Printing and Blueprinting	2.73	2.73
Stationery and Office Supplies	19.02	19.02
Postage	2.25	2.25
Total Engineering	$14,240.12	$14,240.12
Total, Town of Holden Sewer	$14,575.36	$14,575.36
TOTAL WACHUSETT WATERSHED—ELIMINATION OF POLLUTION	$33,295.23	$52,742.74

WESTON AQUEDUCT SIPHONS (PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$418.57	$423.11
Engineering, Headquarters' Office	2,480.90	5,066.29
Total General Overhead	$2,899.47	$5,489.40
ENGINEERING:		
Salaries, Engineering and Clerical	$13,852.68	$14,758.50
Consultant Expense	1.34	65.10
Furniture and Fixtures	33.17	78.17
Engineering Instruments	18.40	64.16
Labor	5.00	5.00
Tools and Equipment	14.70	14.70
Rental of Equipment	0.35	0.35
Miscellaneous Expense (undistributed)	103.51	190.59
Printing and Blueprinting	110.86	229.07
Stationery and Office Supplies	95.99	197.11
Advertising	00.00	207.75
Postage	22.08	22.08
Laboratory Supplies	00.84	00.84
Rent and Upkeep	302.53	321.09
Automobile Maintenance	200.98	205.68
Medical and Surgical Supplies	0.57	0.57
Total Engineering	$14,763.00	$16,360.76
REAL ESTATE:		
Legal Expense	$120.44	$120.44
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 73, Pipe Siphons	$230,537.72	$230,537.72
Contract No. 91, Equipment	1,342.80	1,342.80
Contract No. 91B, "	1,431.36	1,431.36
Sub Total Construction Contracts	$233,311.88	$233,311.88

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Installed Equipment	$252.00	$252.00
Miscellaneous Expense	347.29	347.29
Sub Total Except Construction Contracts	$599.29	$599.29
Total Permanent Construction	$233,911.17	$233,911.17
TOTAL WESTON AQUEDUCT SIPHONS (PWA)	$251,694.08	$255,881.77

NEW PRESSURE AQUEDUCT AND DISTRIBUTING RESERVOIR (PWA)

SECTION OF AQUEDUCT WEST OF NORUMBEGA RESERVOIR:

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$3,374.73	$3,397.99
Engineering, Headquarters' Office	51,503.01	62,313.77
Total General Overhead	$54,877.74	$65,711.76
ENGINEERING:		
Salaries, Engineering and Clerical	$201,867.36	$216,805.20
Consultant Expense	405.25	917.86
Tools and Equipment	645.53	823.85
Furniture and Fixtures	4,295.12	4,639.52
Engineering Instruments	4,836.14	8,969.90
Purchase of Automobiles	13,838.10	22,573.47
Labor	6,639.75	7,218.37
Miscellaneous Expense (undistributed)	5,311.00	7,628.06
Printing and Blueprinting	3,010.40	3,110.47
Stationery and Office Supplies	2,730.29	2,967.07
Advertising	299.53	313.81
Postage	174.67	195.67
Laboratory Supplies	156.17	156.17
Medical and Surgical Supplies	115.26	118.20
Medical and Surgical Services	75.00	75.00
Rent and Upkeep	4,716.24	5,030.59
Automobile Maintenance	4,521.14	4,995.73
Contracts for Investigations and Surveys	00.00	390.00
Rental of Equipment	101.75	101.75
Laboratory Equipment	257.62	257.62
Total Engineering	$253,996.32	$287,288.31
REAL ESTATE:		
Salaries, Engineering and Clerical	$735.83	$2,409.12
Legal Expense	16,674.36	16,674.36
Consultant Expense	150.00	150.00
Printing and Blueprinting	270.40	270.40
Purchases and Settlements	69,650.17	69,650.17
Fire Protection Equipment	63.59	98.28
Special Agents		
Salaries	720.00	720.00
Miscellaneous Expense (undistributed)	73.24	73.24
Stationery and Office Supplies	0.83	0.83

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Automobile Purchase	648.21	648.21
Automobile Maintenance	494.87	494.87
Total Real Estate	$89,481.50	$91,189.48
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 74, Southborough Tunnel	$1,449,355.50	$1,449,355.50
Contract No. 75, Section 1, Cut-and-Cover	265,693.84	265,693.84
Contract No. 76, Borings	13,703.59	13,703.59
Contract No. 77, Section 3, Cut-and-Cover	212,444.98	212,444.98
Contract No. 78, Section 4, Cut-and-Cover	246,770.73	246,770.73
Contract No. 79, Section 5, Cut-and-Cover	274,740.72	274,740.72
Contract No. 85, Furnishing and Delivering Pipe	2,766,285.54	2,766,285.54
Contract No. 81, Section 6, Cut-and-Cover	124,149.69	124,149.69
Contract No. 87A, Equipment	4,972.50	4,972.50
Contract No. 87E, Equipment	1,718.10	1,718.10
Contract No. 86, Gate Valves, Pressure Aqueduct	3,611.52	3,611.52
Sub Total Construction Contracts	$5,363,446.71	$5,363,446.71
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Miscellaneous Expense	$14,628.15	$14,628.15
Temporary Equipment	317.68	317.68
Sub Total Except Construction Contracts	$14,945.83	$14,945.83
Total Permanent Construction	$5,378,392.54	$5,378,392.54
Total, Section of Aqueduct West of Norumbega Reservoir	$5,776,748.10	$5,822,582.09
NORUMBEGA RESERVOIR:		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$190.10	$190.10
Engineering, Headquarters' Office	8,951.23	9,022.20
Total General Overhead	$9,141.33	$9,212.30
ENGINEERING:		
Salaries, Engineering and Clerical	$16,733.38	$16,733.38
Consultant Expense	75.00	75.00
Labor	187.50	187.50
Miscellaneous Expense (undistributed)	23.54	23.54
Printing and Blueprinting	97.67	97.67
Stationery and Office Supplies	61.64	61.64
Medical and Surgical Services	6.00	6.00
Automobile Maintenance	1.28	1.28
Total Engineering	$17,226.01	$17,226.01
REAL ESTATE:		
Salaries, Engineering	$184.71	$184.71
Printing and Blueprinting	5.98	5.98
Maintenance of Real Estate	100.83	100.83
Total Real Estate	$291.52	$291.52
Total Norumbega Reservoir	$26,658.86	$26,729.83

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
SECTION OF AQUEDUCT EAST OF NORUMBEGA RESERVOIR:		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$732.63	$732.63
Engineering, Headquarters' Office	15,612.94	16,041.31
Total General Overhead	$16,345.57	$16,773.94
ENGINEERING:		
Salaries, Engineering and Clerical	$27,353.46	$27,790.01
Consultant Expense	15.15	62.30
Tools and Equipment	128.08	128.08
Furniture and Fixtures	712.48	712.48
Engineering Instruments	593.96	593.96
Purchase of Automobiles	1,182.26	1,182.26
Labor	2,615.68	2,615.68
Laboratory Equipment	251.73	251.73
Installed Equipment	225.00	225.00
Miscellaneous Expense (undistributed)	1,197.25	1,211.28
Printing and Blueprinting	609.29	610.34
Stationery and Office Supplies	596.36	596.36
Advertising	9.53	23.09
Postage	32.67	32.67
Laboratory Supplies	135.20	135.20
Medical and Surgical Supplies	10.30	10.30
Rent and Upkeep	1,304.10	1,304.10
Automobile Maintenance	1,065.87	1,065.87
Rental of Equipment	1.40	1.40
Total Engineering	$38,039.77	$38,552.11
REAL ESTATE:		
Salaries, Engineering and Clerical	$407.99	$442.15
Legal Expense	9,881.56	9,881.56
Printing and Blueprinting	44.12	44.12
Purchases and Settlements	983.50	983.50
Fire Protection		
Equipment	30.04	30.04
Special Agents		
Salaries	180.00	180.00
Automobile Purchase	114.39	114.39
Miscellaneous Expense (undistributed)	12.96	12.96
Stationery and Office Supplies	0.15	0.15
Automobile Maintenance	102.55	102.55
Total Real Estate	$11,757.26	$11,791.42
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 76, Borings	$8,515.29	$8,515.29
Contract No. 81, Section 6, Cut-and-Cover	95,630.54	95,630.54
Contract No. 80, High Level Distributing Reservoir	146,561.84	146,561.84
Contract No. 85, Furnishing and Delivering Pipe	417,363.09	417,363.09

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Contract No. 87A, Equipment	877.50	877.50
Contract No. 86, Gate Valves, Pressure Aqueduct	601.92	601.92
Sub Total Construction Contracts	$669,550.18	$669,550.18
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Miscellaneous Expense	$1,968.72	$1,968.72
Temporary Equipment	43.32	43.32
Sub Total Except Construction Contracts	$2,012.04	$2,012.04
Total Permanent Construction	$671,562.22	$671,562.22
Total, Section of Aqueduct East of Norumbega Reservoir	$737,704.82	$738,679.69
TOTAL NEW PRESSURE AQUEDUCT AND DISTRIBUTING RESERVOIR (PWA)	$6,541,111.78	$6,587,991.61

SPOT POND BY-PASS (PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$285.80	$285.80
Engineering, Headquarters' Office	6,875.38	6,875.38
Total General Overhead	$7,161.18	$7,161.18
ENGINEERING:		
Salaries, Engineering and Clerical	$4,429.35	$4,429.35
Consultant Expense	75.00	75.00
Engineering Instruments	28.04	28.04
Labor	231.87	231.87
Miscellaneous Expense (undistributed)	87.37	87.37
Printing and Blueprinting	92.95	92.95
Stationery and Office Supplies	6.05	6.05
Postage	1.10	1.10
Automobile Maintenance	63.80	63.80
Total Engineering	$5,015.53	$5,015.53
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 83, Spot Pond By-Pass	$25,498.67	$25,498.67
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Miscellaneous Expense	$392.80	$392.80
Total Permanent Construction	$25,891.47	$25,891.47
TOTAL SPOT POND BY-PASS (PWA)	$38,068.18	$38,068.18

ENLARGING MIDDLESEX FELLS RESERVOIR (PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	$2,940.71	$2,940.71
Total General Overhead	$2,940.71	$2,940.71

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
Engineering:		
Salaries, Engineering and Clerical	$812.55	$812.55
Engineering Instruments	24.10	24.10
Automobile Purchase	673.41	673.41
Labor	345.62	345.62
Miscellaneous Expense (undistributed)	41.25	41.25
Printing and Blueprinting	1.53	1.53
Automobile Maintenance	20.31	20.31
Total Engineering	$1,918.77	$1,918.77
Total — Enlarging Middlesex Fells Reservoir (PWA)	$4,859.48	$4,859.48

Charles River Shaft (PWA)

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
General Overhead:		
Administration, Commissioners' Office	$00.00	$00.00
Engineering, Headquarters' Office	1,047.93	1,047.93
Total Charles River Shaft (PWA)	$1,047.93	$1,047.93

Summary

Construction Fund

Total authorized under Chapters 111 and 375, Acts of 1926, and Chapter 321, Acts of 1927		$65,900,000.00	
Amount reverted from authorization under said Chapter 111		261,466.17	
			$65,638,533.83
Received from City of Worcester under said Chapter 321	$1,000,000.00		
Serial Bonds issued and matured	9,840,000.00		
Serial Bonds outstanding Nov. 30, 1939	42,410,000.00		
Balance of bonds available for issue	12,388,533.83		
	$65,638,533.83		
Contributions by Federal Government from PWA Funds			
1938—		$2,475,300.00	
1939—		3,104,400.00	
			5,579,700.00
Total Construction Fund (in Addition to Other Receipts Credited)			$71,218,233.83

Expenditures

Southern Sudbury Emergency Supply	$00.00	$638,533.83

	Year ending Nov. 30, 1939	Total to Nov. 30, 1939
WARE AND SWIFT SUPPLY (INCLUDING PORTION UNDER PWA)		
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct	275,353.93	14,442,464.96
Town of Rutland Sewer (Contribution to WPA Project)	1,008.58	1,008.58
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct	6,786.37	5,394,759.35
Quabbin Reservoir	2,598,655.01	18,594,253.56
Winsor Dam	650,636.53	5,201,400.87
Quabbin Dike	8,636.60	2,871,668.49
SPECIAL INVESTIGATIONS	00.00	149,609.63
WACHUSETT WATERSHED PROTECTION		
Elimination of Pollution	18,719.87	38,167.38
Town of Holden Sewer (Contribution to WPA Project)	14,575.36	14,575.36
PRESSURE AQUEDUCT AND OTHER WORK ENTIRELY UNDER PWA		
Weston Aqueduct Siphons	251,694.08	255,881.77
Pressure Aqueduct and Norumbega Reservoir	6,541,111.78	6,587,991.61
Enlarging Middlesex Fells Reservoir	4,859.48	4,859.48
Spot Pond By-pass	38,068.18	38,068.18
Charles River Shaft	1,047.93	1,047.93
Total Expenditures	$10,411,153.70	$54,234,290.98

RECEIPTS

Receipts from Sales	$54,611.61	$453,474.41
Receipts from Rents	5,090.60	458,015.00
All other Receipts	9,011.00	126,033.96
Total Receipts	$68,713.21	$1,037,523.37

DISTRIBUTION OF RECEIPTS

Credited as follows:

To Assessments			
Rents and Sales, to 1928 Assessment	$3,033.03		
Rents and Sales, to 1929 Assessment	24,343.77		
Interest, to 1928-1934 Assessments	282.11	$00.00	$27,658.91
To Construction Fund		68,713.21	1,009,864.46
		$68,713.21	$1,037,523.37

Financial Statement Verified.
Approved.

WALTER S. MORGAN,
Comptroller.

A tabulation of the acts and resolves under the authority of which expenditures are made by the Metropolitan District Water Supply Commission was included in the 1937 and 1938 Annual Reports.

Subsequent acts of the year 1939, are as follows:

Chapter	*Brief Description*
172	Provision for permanent custody of records of the abandoned towns, Dana, Enfield, Greenwich and Prescott.
176	Provision for transfer of Quabbin Park Cemetery to the Metropolitan District Commission.
286	Metropolitan District Water Supply Commission and the Town of Holden to construct a sewer system.
287	Metropolitan District Water Supply Commission and the Town of Rutland to construct a sewer system.
303	Authorization of the Town of Southborough to take water from the Pressure Aqueduct.
513	Provision for improvements in rivers and streams for protection against flood; where expenditures of Federal, State or Municipal funds have been made.

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

LOCATION OF REAL ESTATE ACQUIRED FOR THE QUABBIN RESERVOIR

(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL Nov. 30, 1938 ACRES	TOTAL FOR YEAR ENDING Nov. 30, 1939 ACRES	TOTAL Nov. 30, 1939 ACRES	REMARKS.
BARRE	22	—	22	*The towns of Dana, Enfield, Greenwich and Prescott were discontinued and divided among the contiguous towns to which they were annexed on April 28, 1938. These details are shown in the 1938 Annual Report.*
BELCHERTOWN	4,790	—	4,790	
HARDWICK	5,103	—	5,103	
NEW SALEM	29,683	34	29,717	
ORANGE	52	—	52	
PELHAM	6,911	—	6,911	
PETERSHAM	20,675	—	20,675	
SHUTESBURY	4,492	—	4,492	
WARE	8,030	—	8,030	
WENDELL	377	—	377	
TOTALS	80,135	34	80,169	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

(SHEET 1 OF 2 SHEETS.)

TAKINGS OF REAL ESTATE AND WATER RIGHTS

TAKING FOR	TAKING NO.	TOWN	COUNTY	DATE OF TAKING	PLAN NO.	TITLE VESTED IN COMMONWEALTH. FEE (Acres)	TITLE VESTED IN COMMONWEALTH. EASEMENT (Acres)
Southern Sudbury Emergency Supply	1 to 9 incl.	Details previously reported in the 1930 Annual Report.			C-1 to C-15 incl.	258.81	29.02
						(Also Water Rights)	
Wachusett-Coldbrook Tunnel section of Quabbin Aqueduct.	1 to 4 incl.	Details previously reported in the 1930 Annual Report.			T-1 to T-13 incl.	570.22	20.37
Coldbrook-Swift Tunnel section of Quabbin Aqueduct.	1 to 3 incl.	Details previously reported in the 1931 Annual Report and included 416.76 acres now reported under Quabbin Reservoir as part of S-29			T-14 to T-27 incl.	128.05	4.06
Quabbin Reservoir.	1 to 29 incl.	Details previously reported in the 1931, 1932, 1933, 1934, 1935, 1936, 1937 and 1938 Annual Reports.			S-1 to S-76 incl.	15,169.38	20.09
						(Also Water Rights)	
" " (Taking of the Waters of the Swift River above Winsor Dam.)		Athol, Barre, Belchertown, Hardwick, New Salem, Orange, Pelham, Petersham, Phillipston, Shutesbury, Ware and Wendell.	Hampshire Franklin and Worcester.	Oct. 5, 1939	None	Water Rights.	
Ware River Supply and Watershed.	1 to 2 incl.	Details previously in the 1931, 1932 and 1933 Annual Reports.			W-1 and A-1 to A-14 incl.	0.25	22.94
						(Also Water Rights)	
Weston Aqueduct Siphons.	1	Wayland	Middlesex	June 1, 1939	D-1	——	0.96
Pressure Aqueduct	1	Southborough	Worcester	Dec. 8, 1938	P-2	30.10	8.66
" "	2	Southborough	Worcester	Feb. 13, 1939	P-1	28.42	——
		Marlborough	Middlesex			1.95	——
" "	3	Framingham	Middlesex	Mar. 9, 1939	P-6 to P-9 incl.	56.38	10.62
		Wayland				7.78	1.08
" "	4	Wayland	Middlesex	Mar. 9, 1939	P-10 & P-10A to P-14 incl.	44.95	8.88
		Natick				6.64	2.38
		Weston				24.81	0.80
" "	5	Framingham	Middlesex	Apr. 13, 1939	P-3 & P-4	47.64	15.20
" "	6	Weston	Middlesex	Apr. 13, 1939	P-15 to P-17 incl.	55.27	22.03
" "	7	Weston	Middlesex	May 8, 1939	P-5	124.05	——
					Carried forward.	427.99	69.65

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

(SHEET 2 OF 2 SHEETS.)

TAKINGS OF REAL ESTATE AND WATER RIGHTS

TAKING FOR	TAK-ING NO.	TOWN	COUNTY	DATE OF TAKING	PLAN NO.	TITLE VESTED IN COMMONWEALTH.	
						FEE (Acres)	EASEMENT (Acres)
					Brought forward.	427.99	69.65
Pressure Aqueduct, (Cont'd.)	8	Southborough	Worcester	May 8, 1939	P-1A	1.74	—
" "	9	Weston	Middlesex	May 25, 1939	P-18	0.48	—
" "	10	Wayland	Middlesex	July 13, 1939	P-19	2.46	—
" "	11	Weston	Middlesex	July 13, 1939	P-20	0.03	—
" "	12	Framingham	Middlesex	Aug. 10, 1939	P-21	0.89	0.31
" "	13	Wayland	Middlesex	Aug. 10, 1939	P-22	0.19	—
" "	14	Weston	Middlesex	Aug. 10, 1939	P-23	0.49	—
" "	15	Framingham	Middlesex	Sept. 7, 1939	P-24	0.17	—
" "	16	Weston	Middlesex	Oct. 19, 1939	P-25	0.73	—
" "	17	Southborough	Worcester	Oct. 19, 1939	P-27	2.51	—
" "	18	Wayland	Middlesex	Oct. 26, 1939	P-28	0.14	—
" "	19	Wayland	Middlesex	Oct. 26, 1939	P-29	0.12	—
							69.96
" "	DEDUCTIONS:-Parcels originally taken as temporary easements and retaken under differing classifications.						- 2.02
						437.94	67.94

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1938 AND NOV. 30, 1939

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
56	Constructing Administration Buildings at Main Dam.	Belchertown	Swift	Rich Bros. Construction Co., Inc.	June 10, 1937	14	June 24, 1937	$362.445.00	$382,118.09	Apr. 27, 1939.
60	Constructing Access Roads to Shaft 12.	Hardwick *	Swift	Middlesex Construction Company	Dec. 2, 1937	22	Dec. 16, 1937	78,348.00	81,625.29	Jan. 16, 1939.
61	Clearing portion of site of Quabbin Reservoir on West Branch of Swift River.	Belchertown, Shutesbury, Pelham, New Salem & Ware.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	5	Oct. 20, 1938	268,700.00	273,203.85	● Oct. 30, 1939.
62	Clearing portion of site of Quabbin Reservoir on Lower Middle and East Branches of Swift River.	Ware, New Salem, Petersham and Hardwick.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	5	Oct. 20, 1938	344,100.00	351,449.05	● Nov. 9, 1939.
63	Clearing portion of site of Quabbin Reservoir on Central portion of Middle Branch of Swift River.	New Salem, Petersham and Hardwick.	Swift	Coleman Bros. Corp.	Oct. 3, 1938	6	Oct. 20, 1938	217,500.00	211,846.30	● Oct. 30, 1939.
64	Constructing Service Buildings at Shafts 1 and 8.	West Boylston and Barre.	Ware	Platt Contracting Co., Inc.	Aug. 25, 1938	6	Oct. 25, 1938	82,000.00	82,511.51	● Nov. 22, 1939.
65	Install Shaft Caps and Aqueduct Control Valves at Shaft 1.	West Boylston	Ware	Engineering Service and Construction Co.	Sept. 8, 1938	5	Sept. 22, 1938	11,335.00	12,644.72	June 27, 1939.
76	Core Borings along Pressure Aqueduct.	Counties of Middlesex, Norfolk, Suffolk & Worcester.	Wachusett	Sprague & Henwood Inc.	Oct. 10, 1938	4	Oct. 20, 1938	11,885.00	22,218.88	● Apr. 24, 1939.
87-A	Automatic & Manual Air Valves.	Wayland, Natick, Weston, Southborough & Framingham.	Wachusett	Gilbert Howe Gleason & Co.	June 15, 1939	2	June 15, 1939	7,515.00	7,515.00	● Oct. 25, 1939.
88	Furnishing and Storing Topsoil at Quabbin Dike & Quabbin Park Cemetery.	Ware	Swift	Warner Bros. & Goodwin, Inc.	Nov. 3, 1938	5	Nov. 3, 1938	7,620.00	8,362.27	July 28, 1939.
91-A	Furnishing and Delivering Gate Valves and Appurtenances.	Framingham	Wachusett	The Chapman Valve Manufacturing Company.	June 29, 1939	2	June 29, 1939	1,492.00	1,492.00	■ Oct. 17, 1939.
91-B	Furnishing and Delivering Gate Hoists.	Framingham	Wachusett	Rodney Hunt Machine Co.	July 27, 1939	3	July 27, 1939	1,590.40	1,590.40	■ Nov. 9, 1939.
98	Removing Steel Bulkhead from Quabbin Aqueduct Tunnel.	Barre	Ware	Warner Bros. & Goodwin, Inc.	Aug. 17, 1939	3	Aug. 17, 1939	1,500.00	1,500.00	Oct. 20, 1939.

(The above contracts were all awarded to the lowest bidder.)

* Portion of this contract is located in the former town of Greenwich.

● Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1551-F, Mass. State Project No. D-208.

■ Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1520-F, Mass. State Project No. D-202.

(SHEET 1 OF 3 SHEETS.)

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1939

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
33	Purchase of Power at Shaft 1.	West Boylston	Ware	New England Power Co.	Date of Agreement = Aug. 6, 1931.			Agreed Rates.	$ 9,028.28
42	Use of Worcester Sewerage System and Treatment Works % Rutland-Holden Sewer.	Worcester	Wore	City of Worcester	Date of Agreement = May 1, 1933			Lump Sum = $ 325,000.00 Annual Charges = *	325,000.00 1,600.54
46	Connection with Rutland-Holden Sewer & Disposal of Sewage from the U.S. Veterans Hospital.	Rutland (Note:- Payments under Contract 46 are RECEIVED by the M.D.W.S.C.)	Ware	U.S. Veterans Administration	Date of Agreement = Nov. 7, 1934			Lump Sum = 37,000.00 Annual Charges = *	37,000.00 2,068.78
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium.	Rutland (Note:- Payments under Contract 48 are RECEIVED by the M.D.W.S.C.)	Ware	Rutland State Sanatorium.	Date of Agreement = June 5, 1934			Lump Sum = 60,000.00 Annual Charges = *	60,000.00 8.28
49	Excavating Diversion Channels at the Site of Quabbin Reservoir.	Dana,** Hardwick & Greenwich.**	Swift	Cenedella & Co.	Sept. 10, 1935.	12	Oct. 1, 1935.	79,050.00	★ 84,789.69
52	Main Dam Embankment - Quabbin Reservoir.	Belchertown, Enfield** & Ware	Swift	Benjamin Foster Company	July 2, 1936	9	July 16, 1936	2,317,445.00	1,984,818.22
66	Regulating Dams on Middle and East Branches of the Swift River.	New Salem, Hardwick and Petersham.	Swift	C.& R. Construction Co.	Aug. 25, 1938	11	Oct 20, 1938	171,650.00	• 148,009.72
68	Connections with Rutland-Holden Sewer and Disposal of Sewage from Town of Rutland.	Rutland (Note:- Payments under Contract 68 are RECEIVED by the M.D.W.S.C.) Cont. 70 is a Ref. No. only for this W.P.A. Sewer Construction.	Ware	Town of Rutland.	Date of Agreement = Oct. 3, 1938. - Annual Charges = *				None
69	Connections with Rutland-Holden Sewer and Disposal of Sewage from Town of Holden.	Holden (Note:- Payments under Contract 69 are RECEIVED by the M.D.W.S.C.) Cont. 71 is a Ref. No. only for this W.P.A. Sewer Construction.	Wachusett	Town of Holden.	Date of Agreement = Aug. 31, 1938. - Annual Charges = *				None
72	Clearing portion of Site of Quabbin Reservoir on Upper Middle and East Branches of Swift River.	New Salem, Hardwick and Petersham.	Swift	C.& R. Construction Co.	Oct. 3, 1938	4	Oct. 20, 1938	469,975.00	• 403,078.95
73	Inverted Pipe Siphons on Weston Aqueduct.	Framingham & Wayland.	Wachusett	Leo Butler Company	Nov. 2, 1938	8	Nov. 9, 1938	265,832.50	■ 230,537.72
74	Constructing the Southborough Tunnel, Section 2 of the Pressure Aqueduct.	Southborough.	Wachusett	West Construction Company	Dec. 15, 1938	8	Dec. 17, 1938	3,197,015.00	• 1,449,355.50
75	Constructing Cut-and-Cover Aqueduct, Section 1 of the Pressure Aqueduct.	Marlborough and Southborough.	Wachusett	B. A. Gardetto, Inc.	Feb. 16, 1939	7	Mar. 9, 1939	503,871.38	• 265,693.84
77	Constructing Cut-and-Cover Aqueduct, Section 3 of the Pressure Aqueduct.	Southborough and Framingham.	Wachusett	B. A. Gardetto, Inc.	Apr. 18, 1939	6	Apr. 18, 1939	497,382.48	• 212,444.98

(The above contracts were all awarded to the lowest bidder.)

- * Proportion of Annual Maintenance Cost.
- ★ Work accepted, final settlement pending.
- • Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1551-F, Mass. State Project No. D-208.
- ■ Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1520-F, Mass. State Project No. D-207.
- ** Annexed to adjoining towns since contract was awarded.

(SHEET 2 OF 3 SHEETS.)

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1939

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
78	Constructing Cut-and-Cover Aqueduct, Section 4 of the Pressure Aqueduct.	Framingham and Wayland.	Wachusett	American Concrete and Steel Pipe Company.	Mar. 9, 1939	15	Mar. 18, 1939 *	$ 535,554.60	$ • 246,770.73
79	Constructing Cut-and-Cover Aqueduct, Section 5 of the Pressure Aqueduct.	Wayland, Natick and Weston.	Wachusett	American Concrete and Steel Pipe Company.	Mar. 9, 1939	11	Mar. 18, 1939 *	536,950.22	• 274,740.72
80	Constructing Norumbega High Level Reservoir on Pressure Aqueduct.	Weston	Wachusett	Carlo Bianchi and Company Inc.	June 1, 1939	6	June 1, 1939	478,605.49	• 146,561.84
81	Constructing Cut-and-Cover Aqueduct, Section 6 of the Pressure Aqueduct.	Weston	Wachusett	M. F. Gaddis Inc.	Apr. 13, 1939	6	Apr. 18, 1939	560,432.25	• 219,780.23
82	Constructing Administration Road.	Ware	Swift	G. Rotondi & Son.	Feb. 16, 1939	10	Mar. 9, 1939	219,060.92	• 166,258.19
83	Constructing Spot Pond By-Pass.	Stoneham and Medford	Wachusett	S. Rotondi & Sons.	Aug. 3, 1939	12	Aug. 10, 1939	143,928.28	• 25,498.67
85	Furnishing and Delivering Pre-Cast Steel Cylinder Reinf. Concrete Pressure Pipe.	Wayland, Natick, Weston, Southborough & Framingham	Wachusett	Lock Joint Pipe Co.	Dec. 19, 1938	4	Dec. 28, 1938	4,164,126.50	• 3,192,948.63
86	Furnishing and Delivering Gate Valves.	Framingham, Weston, Southborough, Wayland, Marlborough & Natick.	Wachusett	The Chapman Valve Manufacturing Company.	May 25, 1939	4	May 25, 1939	79,330.70	• 4,213.44
87-B&C	Furnish and Deliver Needle Valve and Discharge Control Valve.	Southborough.	Wachusett	The Chapman Valve Manufacturing Company.	June 15, 1939	1	June 15, 1939	18,917.00	• None
87-D	Furnish and Deliver-Flap Valve & Gate Valves.	Southborough.	Wachusett	Crane Company.	June 15, 1939	3	July 13, 1939	2,527.47	• None
87-E	Furnish and Deliver Meter Register-Indicator-Recorders & Piezometer Rings.	Southborough.	Wachusett	Builders Iron Foundry.	June 15, 1939	2	June 15, 1939	6,323.00	• 1,718.10
87-F	Furnish and Deliver Tunnel Unwatering Pump.	Southborough	Wachusett	Warren Steam Pump Company Inc.	June 15, 1939	1	June 15, 1939	3,354.00	• None
87-G	Furnish and Deliver Sump Pump.	Southborough	Wachusett	Lunt Moss Company	June 15, 1939	5	June 15, 1939	746.50	• None
87-H	Furnish and Deliver Air Blower.	Southborough	Wachusett	B. F. Sturtevant Company.	June 15, 1939	1	June 15, 1939	465.67	• None
89	Constructing Mortar Lining in Existing Sudbury River and Happy Hollow Steel Pipe Siphons of the Weston Aqueduct.	Framingham and Wayland.	Wachusett	Marinucci Brothers and Company.	Oct. 26, 1939	5	Oct. 26, 1939	38,417.75	■ None

(The above contracts were all awarded to the lowest bidder.)

* American Concrete and Steel Pipe Company was awarded both Contracts under Proposal "B".

• Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1551-F, Mass. State Project No. D-208.

■ Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass. 1520-F, Mass. State Project No. D-202.

(Sheet 3 of 3 Sheets.)

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1939

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
90-A	Furnish and Deliver- Gasoline engine driven, Electric Generating Unit, Complete.	Weston	Wachusett	Sandberg Equipment Co.	Aug. 24, 1939	1	Oct. 19, 1939	$ 1,224.00	• None.
90-B	Furnish and Deliver- Traveling Crane and Chain Hoists.	Marlboraugh, Stoneham Southborough & Weston.	Wachusett	Robert Abel, Inc.	Aug. 24, 1939	1	Aug. 24, 1939.	2,359.25	• None.
90-C	Furnish and Deliver- Flanged and Spigot Pipes and Elbows.	Southborough & Weston.	Wachusett	Fred A. Houdlette & Son, Inc.	Aug. 24, 1939	3	Aug. 24, 1939.	2,110.47	• None.
90-D	Furnish and Deliver- Special Two-way Bronze Stop Valve.	Southborough	Wachusett	Lombard Governor Corp.	Aug. 24, 1939	1	Aug. 24, 1939.	459.75	• None
90-E	Furnish and Deliver- Motor driven Sump Pump of Deep Well Turbine Type.	Stoneham	Wachusett	Lunt Moss Company	Aug. 24, 1939	2	Aug. 24, 1939.	257.00	• None.
92-A, B & C.	Furnish and Deliver- Gate Valves, Check Valve and Regulating Valve.	Stoneham and Medford	Wachusett	The Chapman Valve Manufacturing Company.	July 27, 1939	1	July 27, 1939.	24,073.00	• None.
92-D.	Furnish and Deliver- Pressure Relief Valves.	Southborough	Wachusett	Lombard Govenor Corp.	July 27, 1939	1	July 27, 1939.	2,774.10	• None.
92-E	Furnish and Deliver- Flange, Spigot and Special Pipes, Sleeve and Tee.	Southborough and Stoneham.	Wachusett	Warren Foundry & Pipe Corp.	July 27, 1939	3	July 27, 1939.	7,971.44	• None.
93	Completing the East Branch Baffle.	Petersham* & Hardwick.*	Swift	J. J. Callahan.	Oct. 19, 1939	9	Oct. 19, 1939.	28,876.75	• $4,907.47
100	Placing Mortar Lining in the Wachusett Aqueduct at its Crossing with the Assabet River.	Northborough.	Wachusett	The National Gunite Contracting Company.	Oct. 19, 1939	3	Oct. 19, 1939.	5,805.80	• None.

(The above contracts were all awarded to the lowest bidder.)

• Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass., 1551-F, Mass. State Project No. D-208.
* In an area formerly the Town of Greenwich.

(Sheet 3 of 3 Sheets.)

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1939

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
90-A	Furnish and Deliver- Gasoline engine driven, Electric Generating Unit, Complete.	Weston	Wachusett	Sandberg Equipment Co.	Aug. 24, 1939	1	Oct. 19, 1939.	$ 1,224.00	• None.
90-B	Furnish and Deliver- Traveling Crane and Chain Hoists.	Marlborough, Stoneham, Southborough & Weston.	Wachusett	Robert Abel, Inc.	Aug. 24, 1939	1	Aug. 24, 1939	2,359.25	• None.
90-C	Furnish and Deliver- Flanged and Spigot Pipes and Elbows.	Southborough & Weston.	Wachusett	Fred A. Houdlette & Son, Inc.	Aug. 24, 1939	3	Aug. 24, 1939.	2,110.47	• None.
90-D	Furnish and Deliver- Special Two-way Bronze Stop Valve.	Southborough	Wachusett	Lombard Governor Corp.	Aug. 24, 1939	1	Aug. 24, 1939.	459.75	• None
90-E	Furnish and Deliver- Motor driven Sump Pump of Deep Well Turbine Type.	Stoneham	Wachusett	Lunt Moss Company	Aug. 24, 1939	2	Aug. 24, 1939.	257.00	• None.
92-A, B & C.	Furnish and Deliver- Gate Valves, Check Valve and Regulating Valve.	Stoneham and Medford	Wachusett	The Chapman Valve Manufacturing Company.	July 27, 1939	1	July 27, 1939.	24,073.00	• None.
92-D.	Furnish and Deliver- Pressure Relief Valves.	Southborough	Wachusett	Lombard Govenor Corp.	July 27, 1939	1	July 27, 1939.	2,774.10	• None.
92-E	Furnish and Deliver- Flange, Spigot and Special Pipes, Sleeve and Tee.	Southborough and Stoneham.	Wachusett	Warren Foundry & Pipe Corp.	July 27, 1939	3	July 27, 1939.	7,971.44	• None.
93	Completing the East Branch Baffle.	Petersham* & Hardwick.*	Swift	J. J. Callahan.	Oct. 19, 1939	9	Oct. 19, 1939.	28,876.75	• $4,907.47
100	Placing Mortar Lining in the Wachusett Aqueduct at its Crossing with the Assabet River.	Northborough.	Wachusett	The National Gunite Contracting Company.	Oct. 19, 1939	3	Oct. 19, 1939.	5,805.80	• None.

(The above contracts were all awarded to the lowest bidder.)

- • Contract financed with aid of Federal Grant, P.W.A. Docket No. Mass., 1551-F, Mass. State Project No. D-208.
- * In an area formerly the Town of Greenwich.

CANVASS OF BIDS FOR CONTRACT 74 - OPENED DEC. 15, 1938

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 74

FOR CONSTRUCTING THE SOUTHBOROUGH TUNNEL, SECTION 2 OF PRESSURE AQUEDUCT, IN THE TOWN OF SOUTHBOROUGH, MASS.
P.W.A. DOCKET NO. MASS. 1551-F
MASS. STATE PROJECT NO. D-208

				★ ① West Construction Company Rm. 900-60 State St. Boston Mass.		② Winston Bros., Company 1470 Northwestern Bank Bldg. Minneapolis, Minn.		③ Bates & Rogers Construction Corporation 111 W. Washington St. Chicago, Ill.		④ The Hunkin-Conkey Construction Co. Cleveland, Ohio. Shofner, Gordon & Hinman Los Angeles, Calif. D. W. Thurston Los Angeles, Calif.		⑤ B. Perini and Sons, Inc. Framingham, Mass. C. J. Maney Co., Inc. Boston, Mass. Leo Butler Co. Katonah, N.Y.		⑥ Samuel R. Rosoff Ltd. 295 Madison Ave., New York, N.Y.		⑦ Dravo Corporation Neville Island Branch Pittsburgh, Pa.		⑧ The Arthur A. Johnson Corp. and Necaro Co., Inc. 2928 Hunter Ave. Long Island City, N.Y.	
Item	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Earth Excavation in Shafts	800	Cu Yd.	$ 19.50	$ 15,600	$ 11.00	$ 8,800	$ 10.00	$ 8,000	$ 50.00	$ 40,000	$ 13.70	$ 10,960	$ 20.00	$ 16,000	$ 15.00	$ 12,000	$ 35.00	$ 28,000
2	Rock Excav. in Shafts	11,000	Cu. Yd.	19.50	214,500	40.00	440,000	20.00	220,000	50.00	550,000	32.00	352,000	30.00	330,000	25.00	275,000	35.00	385,000
3	Excavation in Tunnel	150,000	Cu. Yd.	9.60	1,440,000	9.65	1,447,500	12.30	1,845,000	11.94	1,791,000	12.35	1,852,500	15.00	2,250,000	13.50	2,025,000	17.50	2,625,000
4	Enlargement of Shafts and Tunnel in Rock	2,500	Cu. Yd.	10.50	26,250	10.00	25,000	12.00	30,000	12.00	30,000	12.35	30,875	5.50	13,750	5.00	12,500	10.00	25,000
5	Earth Excav. not included in Item 1	10 000	Cu. Yd.	.50	5,000	.35	3,500	1.20	12,000	1.00	10,000	2.37	23,700	.50	5,000	2.00	20,000	.55	5,500
6	Rock Excav. not incl. in Items 2, 3 or 4	1,200	Cu Yd.	1.35	1,620	3.50	4,200	6.00	7,200	3.00	3,600	4.10	4,920	5.00	6,000	6.00	7,200	3.30	3,960
7	Pumping from Shafts and Tunnel	30,000	Mil. Ft. Gals	1.00	30,000	.10	3,000	1.10	33,000	.80	24,000	.48	14,400	.25	7,500	.12	3,600	.10	3,000
8	Drainage Channels for Shafts and Tunnel	16,650	Lin. Ft.	3.00	49,950	4.00	66,600	970	161,505	10.00	166,500	3.10	51,615	10.00	166,500	18.50	308,025	7.00	116,550
9	Forms for Concrete Lining of Shaft 1	185	Lin. Ft.	25.00	4,625	60.00	11,100	40.00	7,400	50.00	9,250	40.00	7,400	50.00	9,250	60.00	11,100	40.00	7,400
10	Forms for Concrete Lining of Shaft 4	155	Lin. Ft.	45.00	6,975	75.00	11,625	54.50	8,447.50	100.00	15,500	117.00	18,135	50.00	7,750	115.00	17,825	65.00	10,075
11	Forms for Conc. Lining of Shafts 2 and 3	460	Lin. Ft.	17.00	7,820	20.00	9,200	20.00	9,200	20.00	9,200	40.00	18,400	60.00	27,600	50.00	23,000	40.00	18,400
12	Forms for Concrete Lining of Tunnel	15,870	Lin. Ft	4.40	69,828	5.00	79,350	7.30	115,851	7.00	111,090	10.00	158,700	20.00	317,400	20.00	317,400	10.00	158,700
13	Concrete Masonry in Shafts	3,500	Cu. Yd.	14.00	49,000	15.00	52,500	20.00	70,000	10.00	35,000	17.60	61,600	15.00	52,500	20.00	70,000	12.00	42,000
14	Concrete Masonry in Tunnel	60,000	Cu Yd.	7.32	439,200	6.40	384,000	5.00	300,000	4.50	270,000	7.25	435,000	6.00	360,000	7.00	420,000	8.00	480,000
15	Conc. Masonry not incl. in Items 13 or 14	1,000	Cu Yd.	19.80	19,800	20.00	20,000	13.00	13,000	10.00	10,000	13.70	13,700	15.00	15,000	23.00	23,000	18.25	18,250
16	Excess Conc Masonry in Shafts & Tun. @ $5.00/Cu. Yd	1,000	Cu Yd.	5.00	5,000	5.00	5,000	5.00	5,000	5.00	5,000	5.00	5,000	5.00	5,000	5.00	5,000	5.00	5,000
17	Steel Linings for Shaft 4	165,000	Pound	.11	18,150	.10	16,500	.20	33,000	.10	16,500	.15	24,750	.25	41,250	.12	19,800	.11	18,150
18	Struct.-Steel Support in Shafts & Tunnel	250,000	Pound	.06	15,000	.13½	33,750	.10	25,000	.08	20,000	.082	20,500	.06	15,000	.09	22,500	.05½	13,750
19	Timbering in Shafts and Tunnel	50	M.B.M.	85.00	4,250	120.00	6,000	170.00	8,500	110.00	5,500	137.00	6,850	80.00	4,000	120.00	6,000	100.00	5,000
20	Timber and Lumber not in Tunnel or Shafts	10	M.B.M	50.00	500	120.00	1,200	130.00	1,300	125.00	1,250	117.00	1,170	80.00	800	100.00	1,000	100.00	1,000
21	Dry Packing	1,000	Cu. Yd.	5.00	5,000	5.00	5,000	10.00	10,000	6.50	6,500	5.50	5,500	5.00	5,000	7.50	7,500	9.00	9,000
22	Drilling Holes in Rock or Masonry	16,000	Lin. Ft.	.60	9,600	.60	9,600	1.00	16,000	.70	11,200	1.00	16,000	.75	12,000	.80	12,800	1.00	16,000
23	Steel Pipe for Grouting	18,000	Lin. Ft.	.60	10,800	.30	5,400	.35	6,300	.70	12,600	.68	12,240	.50	9,000	.80	14,400	1.00	18,000
24	Connections for Grouting	4,500	Conn't.	2.25	10,125	1.25	5,625	2.65	11,925	3.00	13,500	4.10	18,450	1.50	6,750	5.00	22,500	3.00	13,500
25	Sand for Grout and Cement Mortar	4,000	Cu. Yd.	1.95	7,800	2.70	10,800	3.00	12,000	2.50	10,000	2.75	11,000	3.00	12,000	3.00	12,000	4.00	16,000
26	Mixing and Placing Grout	12,000	Cu. Yd.	15.00	180,000	5.00	60,000	20.00	240,000	15.00	180,000	12.85	154,200	8.00	96,000	15.00	180,000.	10.00	120,000
27	Protective Coating of Cement Mortar	400	Cu. Yd.	25.00	10,000	15.00	6,000	20.00	8,000	25.00	10,000	29.80	11,920	15.00	6,000	25.00	10,000	20.00	8,000
28	Portland Cement	170,000	Barrel	2.40	408,000	2.50	425,000	2.36	401,200	2.00	340,000	2.25	382,500	2.30	391,000	2.50	425,000	2.20	374,000
29	Steel for Reinforcing Concrete	55,000	Pound	.07	3,850	.06	3,300	.06½	3,575	.06	3,300	.061	3,355	.07	3,850	.07	3,850	.05	2,750
30	Bituminous Curing Sol. for Conc. Masonry	10,000	Sq. Yd.	.22	2,200	.14	1,400	.08	800	.10	1,000	.14	1,400	.08	800	.10	1,000	.10	1,000
31	Refilling and Embanking	17,000	Cu. Yd.	.60	10,200	.34	5,780	1.00	17,000	.60	10,200	.68	11,560	.30	5,100	1.20	20,400	.75	12,750
32	Impervious Soil Blankets and Cores	2,000	Cu. Yd.	.75	1,500	.80	1,600	2.00	4,000	1.60	3,200	4.10	8,200	1.50	3,000	2.50	5,000	1.50	3,000
33	Removal of Soil	15,000	Cu. Yd.	.60	9,000	28	4,200	1.30	19,500	1.00	15,000	.34	5,100	1.00	15,000	1.20	18,000	.80	12,000
34	Surface Dressing of Top Soil	15,000	Cu. Yd.	.60	9,000	.34	5,100	2.00	30,000	.60	9,000	1.00	15,000	1.50	22,500	1.20	18,000	.70	10,500
35	Seeding and Grassing	20	Acre	150.00	3,000	100.00	2,000	300.00	6,000	200.00	4,000	240.00	4,800	100.00	2,000	350.00	7,000	60.00	1,200
36	Misc. Cast Iron, Wrought Iron and Steel	70,000	Pound	.12	8,400	.14	9,800	.09	6,300	.12	8,400	.14	9,800	.10	7,000	.12	8,400	.15	10,500
37	Galvanizing	6,000	Pound	.15	900	.05	300	.02	120	.03	180	.04	240	.50	3,000	.05	300	.05	300
38	Misc. Bronze, Brass and Copper	7,000	Pound	.60	4,200	.75	5,250	.55	3,850	.80	5,600	.61	4,270	1.00	7,000	.80	5,600	1.25	8,750
39	Misc. Nickel-Copper Alloys	800	Pound	.80	640	1.00	800	1.00	800	.50	400	1.00	800	.50	400	1.00	800	1.25	1,000
40	Setting Metal Work furn. by Comm.	40,000	Pound	.05	2,000	.06	2,400	.033	1,320	.05	2,000	.04	1,600	.07	2,800	.04	1,600	.06	2,400
41	Tile Pipe 6" and less in Diam.	50	Lin. Ft.	1.00	50	1.00	50	.45	22.50	1.00	50	1.00	50	3.00	150	1.00	50	1.00	50
42	Tile Pipe 8" to 12" incl. in Diam.	300	Lin. Ft.	1.50	450	2.00	600	1.05	315.	1.10	330	1.00	300	5.00	1,500	1.50	450	2.00	600
43	Stone Masonry	10	Cu. Yd.	92.50	925	40.00	400	50.00	500	180.00	1,800	100.00	1,000	20.00	200	50.00	500	150.00	1,500
44	Paving	200	Cu. Yd.	4.75	950	6.00	1,200	8.25	1,650	12.00	2400	4.10	820	15.00	3,000	10.00	2,000	8.00	1,600
45	Crushed Stone, Gravel and Sand	100	Cu. Yd.	2.87	287	3.25	325	3.85	385	3.00	300	4.80	480	3.50	350	4.00	400	4.50	450
46	Alterations to Weston Aqueduct Overflow	——	Lump Sum	500.00	500	2,500.00	2,500	400.00	400	1,000.00	1,000	1,370.00	1,370	35000.00	35,000	5,000.00	5,000	5,000.00	5,000
47	Mortar Lining for Steel Shaft Head Shaft 4	2,700	Sq. Ft.	1.00	2,700	.70	1,890	1.00	2,700	.30	810	.68	1,836	1.00	2,700	3.00	8,100	3.00	8,100
48	Riprap	600	Cu. Yd.	3.50	2,100	1.50	900	5.60	3,360	2.00	1,200	4.10	2,460	5.00	3,000	4.00	2,400	3.00	1,800
49	Electrical Work	——	Lump Sum	1,000.00	1,000	2,700.00	2,700	2,000.00	2,000	4,000.00	4,000	5,350.00	5,350	14,000.00	14,000	4,500.00	4,500	2,500.00	2,500
50	Construction of Shaft 4 in Addition etc.	——	Lump Sum	5,000.00	5,000	1,000.00	1,000	4,500.00	4,500	1,000.00	1,000	4,100.00	4,100	25,000.00	25,000	3,500.00	3,500	25,000.00	25,000
51	Fences for Sanitary Protection of Watershed	16,000	Lin. Ft.	.55	8,800	.60	9,600	.50	8,000	1.10	17,600	.58	9,280	2.00	32,000	.75	12,000	1.60	25,600
52	Permanent Access Road to Shaft 4	——	Lump Sum	16,980.00	16,980	7,000.00	7,000	17,600.00	17,600	11,000.00	11,000	11,650.00	11,650	27,700.00	27,700	30,000.00	30,000	20,000.00	20,000
53	Medical and Hospital Services	18	Month	300.00	5,400	100.00	1,800	500.00	9,000	500.00	9,000	275.00	4,950	500.00	9,000	1,500.00	27,000	2,000.00	36,000
54	Sanitary Services	18	Month	600.00	10,800	1,100.00	19,800	1,160.00	20,880	1,000.00	18,000	1,000.00	18,000	500.00	9,000	2,000.00	36,000	5,000.00	90,000
55	Hypochlorite of Lime	10,000	Pound	.04	400	.05	500	.05½	550	.05	500	.04	400	.10	1,000	.15	1,500	.60	6,000
56	Liquid Chlorine	3,000	Pound	.15	450	.09	270	.10	300	.10	300	.11	330	.15	450	.15	450	.15	450
57	Chlorine Dosing Machines	4	Machine	2,000.00	8,000	1,600.00	6,400	4750.00	19,000	1,200.00	4,800	2,050.00	8,200	5,000.00	20,000	2000.00	8,000	5,000.00	20,000
58	Locker Houses	4	House	2,000.00	8,000	1,000.00	4,000	4,350.00	17,400	2,000.00	8,000	3,000.00	12,000	8000.00	32,000	6,000.00	24,000	6,000.00	24,000
59	15" Reinforced Concrete Pipe	125	Lin. Ft.	2.00	250	2.00	250	2.50	312.50	2.00	250	1.88	235	5.00	625	2.00	250	3.00	375
60	30" Reinforced Concrete Pipe	150	Lin. Ft.	4.60	690	5.00	750	6.25	937.50	5.00	750	4.30	645	7.00	1,050	5.00	750	6.00	900
61	Cleaning Up	——	Lump Sum	2000.00	2,000	5000.00	5,000	6200.00	6200.	4,000.00	4,000	12,805.00	12,805	10,000.00	10,000	18,000.00	18,000	15,000.00	15,000
62	Restoration of Grounds	——	Lump Sum	2,000.00	2,000	1,000.00	1,000	700.00	700	2,000.00	2,000	5,500.00	5,500	7,000.00	7,000	7,000.00	7,000	10,000.00	10,000
	Totals				$3,197,015.00		$3,266,115.00		$3,828,806.00		$3,858,560.00		$3,891,871.00		$4,495,225.00		$4,565,950.00		$4,905,310.00
	Bid Bond Deposit				$150,000.00		$150,000.00		$150,000.00		$150,000.00		$150,000.00		$150,000.00		$150,000.00		* $150,000.00

* Certified check

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 74 received this day by the Metr. Distr. Water Supply Commission.

★ Contract executed Dec. 30, 1938
Contract awarded Dec. 17, 1938

R. Nelson Molt
R. Nelson Molt, Secretary.

CANVASS OF BIDS FOR CONTRACT 75 - OPENED FEB. 16, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 75

FOR CONSTRUCTING CUT-AND-COVER AQUEDUCT, SECT. I OF PRESSURE AQUEDUCT, IN THE TOWNS OF MARLBOROUGH AND SOUTHBOROUGH, MASS.
P.W.A. DOCKET NO. MASS. 1551-F, MASS. STATE PROJECT NO. D-208

				* ① B.A. Gardetto Inc. 79 Milk St., Boston, Mass.		② American Concrete and Steel Pipe Co. P.O. Box 1428 Arcade Sta., Los Angeles, Cal.		③ Coleman Bros. Corp. 245 State St., Boston, Mass.		④ C&R Construction Company 75 Bradeen St., Roslindale, Mass.		⑤ Joseph P. McCabe Inc. 509 East First St., South Boston, Mass.		⑥ B. Perini & Sons Inc., Framingham, Mass.		⑦ Leo Butler Company Katonah, N.Y.	
Item	Description	Unit	Quantity	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	Acre	15	$ 75.	$ 1,125	$ 150	$ 2,250.	$ 100.	$ 1,500	$ 100.	$ 1,500	$ 150.	$ 2,250	$ 130.	$ 1950	$ 143.	$ 2,145
2	Grubbing	Acre	10	150.	1,500	150	1,500.	150.	1,500	100.	1,000	250.	2,500	240.	2,400	143.	1,430
3	Stripping	Cu. Yd.	30,000	.70	21,000	.20	6,000.	.25	7,500	.35	10,500	.45	13,500	1.05	31,500	.72	21,600
4	Rough grading for pipe delivery	Sq. Yd.	20,000	.05	1,000	.12	2,400	.03	600	.04	800	.25	5,000	.05	1,000	.07	1,400
5	Earth excavation	Cu. Yd.	180,000	.40	72,000	.40	72,000.	.45	81,000	.50	90,000	.65	117,000	1.05	189,000	.59	106,200
6	Rock excavation	Cu. Yd.	15,000	2.50	37,500	2.50	37,500.	.45	6,750	3.	45,000	2.25	33,750	1.05	15,750	2.85	42,750
7	Compacted refill and embankment	Cu. Yd.	20,000	.80	16,000	.60	12,000.	.50	10,000	.30	6,000	.65	13,000	.13	2,600	.93	18,600
8	Refill and embkmt. (except Items 7 and 9)	Cu. Yd.	150,000	.18	27,000	.23	34,500.	.20	30,000	.20	30,000	.65	97,500	.13	19,500	.16	24,000
9	Misc. unconsolidated embankments	Cu. Yd.	10,000	.15	1,500	.15	1,500.	.18	1,800	.10	1,000	.50	5,000	.13	1,300	.14	1,400
10	Soil dressing	Cu. Yd.	24,000	.70	16,800	.30	7,200.	.75	18,000	.50	12,000	.75	18,000	.75	18,000	.93	22,320
11	Seeding and grossing	Acre	20	150.	3,000	125.	2,500.	200.	4,000	250.	5,000	500.	10,000	275.	5,500	270.	5,400
12	Gravel surfacing for roads	Cu. Yd.	5,000	.50	2,500	2.	10,000.	1.	5,000	.50	2,500	1.	5,000	1.	5000	3.50	17,500
13	Crushed stone and screened gravel	Cu. Yd.	3,000	3.	9000	3.75	11,250	2.50	7,500	2.50	7,500	2.50	7,500	3.50	10,500	2.85	8,550
14	Paving	Cu. Yd.	600	4.	2400	5.50	3,300.	3.	1,800	4.	2,400	3.	1800	4.	2,400	7.	4,200
15	Riprap	Cu. Yd.	200	2.	400	4.50	900.	3.	600	2.	400	3.	600	3.	600	4.30	860
16	Laying conc. pipe, furn. by Commission	Lin. Ft.	9,600	6.10	58,560	11.05	106,080.	14.	134,400	16.50	158,400	8.25	79,200	12.	115,200	20.75	199,200
17	Setting metal work, furn. by Commission	Pound	6,000	.05	300	.03	180.	.04	240	.05	300	.10	600	.06	360	.04	240
18	Conc. foundations and anchorages for pipe	Cu. Yd.	10,000	7.	70,000	6.	60,000.	7.	70,000	4.50	45,000	5.50	55,000	8.	80,000	7.10	71,000
19	Reinforced concrete	Cu. Yd.	1,300	14.	18,200	18.50	24,050.	13.	16,900	12	15,600	12.50	16,250	16.	20,800	18.	23,400
20	Miscellaneous concrete	Cu. Yd.	500	14.	7,000	12.	6,000.	15.	7,500	12.	6,000	15.	7,500	16.	8,000	18.	9,000
21	Reinforcing steel	Pound	150,000	.04	6,000	.05	7,500.	.04	6,000	.037	5,550	.04	6,000	.05	7,500	.054	8,100
22	Portland cement	Barrel	20,000	2.75	55,000	2.50	50,000.	2.50	50,000	2.50	50,000	2.85	57,000	2.40	48,000	2.60	52,000
23	Steel-plate pipe and specials	Pound	50,000	.15	7,500	.15	7,500.	.10	5,000	.10	5,000	.10	5,000	.20	10,000	.21	10,500
24	Mortar lining for steel pipe	Sq. Ft.	2,500	.45	1,125	.25	625.	.50	1,250	.45	1,125	.75	1,875	.50	1,250	.80	2,000
25	Structural steel	Pound	60,000	.10	6,000	.09	5,400.	.05	3,000	.15	9,000	.10	6,000	.10	6,000	.065	3,900
26	Galvanizing	Pound	20,000	.04	800	.02	400.	.05	1,000	.03	600	.05	1,000	.05	1,000	.035	700
27	Cast-iron pipe and specials	Pound	25,000	.10	2,500	.06	1,500.	.06	1,500	.04	1,000	.06	1,500	.10	2,500	.11	2,750
28	Steel castings	Pound	1,000	.10	100	.20	200.	.20	200	.30	300	.25	250	.10	100	.30	300
29	Misc. non-ferrous metals	Pound	3,000	.70	2,100	.30	900.	.40	1,200	.50	1,500	.50	1,500	1.	3000	1.40	4,200
30	Stone masonry	Cu. Yd.	220	100.	22,000	10.	2,200.	65.	14,300	95.	20,900	75.	16,500	70.	15,400	105.	23,100
31	Brick masonry	Cu. Yd.	10	50.	500	30.	300.	100.	1,000	35.	350	150.	1,500	100.	1,000	.80	800
32	Rubble masonry	Cu. Yd.	20	10.	200	7.50	150.	13.	260	10.	200	10.	200	15.	300	14.30	286
33	Cobble gutters	Cu. Yd.	500	2.	1,000	8.50	4250.	5.	2,500	2.	1,000	3.	1,500	4.	2,000	14-30	7,150
34	Corrugated metal culverts	Pound	7,000	.12	840	.07	490.	.15	1,050	.10	700	.15	1,050	.08	560	.13	910
35	Miscellaneous lumber	M.ft. B.M.	15	75.	1,125	90.	1,350.	80.	1,200	60.	900	150.	2,250	175.	2625	140.	2,100
36	Tile pipe 8" or less in diameter	Lin. Ft.	2,000	.50	1,000	.75	1,500.	.60	1,200	1.	2,000	.45	900	.40	800	.70	1,400
37	Tile pipe 10" to 18" in diameter	Lin. Ft.	500	2.	1,000	2.	1,000.	1.	500	1.	500	1.50	750	1.25	625	2.15	1,075
38	Replacing highway pavement	Sq. Yd.	700	2.50	1,750	3.15	2,205.	1.50	1,050	1.25	875	2.50	1,750	1.50	1,050	1.80	1,260
39	Permonent fencing, Type A	Lin. Ft.	25,000	.50	12,500	.42	10,500.	.40	10,000	.40	10,000	.45	11,250	.40	10,000	.55	13,750
40	Permanent fencing, Type B	Lin. Ft.	6,000	.30	1,800	.16	960.	.15	900	.18	1,080	.20	1,200	.15	900	.55	3,300
41	Highway crossings	Each	2	400.	800	500.	1,000.	200.	400	2000.	4,000	1,000.	2,000	500.	1,000	360.	720
42	Maintaining flow in open channel	Lump Sum		1,000.	1,000	3,500.	3,500.	5,000.	5,000	5,000.	5,000	25,000.	25,000	2,000.	2,000	4,300.	4,300
43	Intake structure, etc.	Lump Sum		2,000.	2,000	3,000.	3,000.	1,000.	1,000	2,500.	2,500	7,500.	7,500	1,500.	1,500	14,000.	14,000
44	Cleaning up	Lump Sum		1,000.	1,000	2,500.	2,500.	1,000.	1,000	1,000.	1,000	5,000.	5,000	500.	500	2,900.	2,900
	Sub-total, (Items 1 to 44 inclusive)				$496,425.00		$510,040.00		$517,100.00		$565,980.00		$649,425.00		$650,970.00		$742,696.00
45	Furnishing performance bond – Rate per $1000			15.	7,446.38	15.	7,650.60	15.	7,756.50	15.	8489.70	15.	9,741.375	15.	9,764.55	15.	11,140.44
	Totals				$503,871.38		$517,690.60		$524,856.50		$574,469.70		$659,166.38		$660,734.55		$753,836.44
	Bid Bond Deposit				27,500.00		27,500.00		C.C. 27,500.00		27,500.00		27,500.00		27,500.00		C.C. 27,500.00

C.C. = Certified check.

I certify the foregoing to be a true and accurate eummary of all bids on the above Contract No. 75 received this day by the Metr. Distr. Water Supply Commission.

R Nelson Molt
R. Nelson Molt, Secretary

* Contract awarded 3-9-39
Contract executed 3-13-39

CANVASS OF BIDS FOR CONTRACT 77 — OPENED APRIL 18, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
CONTRACT 77
FOR CONSTRUCTING CUT-AND-COVER AQUEDUCT, SECT. 3 OF PRESSURE AQUEDUCT IN THE TOWNS OF SOUTHBOROUGH AND FRAMINGHAM MASS.
P.W.A. DOCKET NO. MASS. 1551-F, MASS. STATE PROJECT NO. D-208

				① ★ B.A. Gardetto, Inc. 123 Terrace St. Roxbury Crossing, Mass.		② Carlo Bianchi + Company, Inc., 24 Union Ave., Framingham, Mass.		③ C+R. Construction Co., 75 Braden St., Roslindale, Mass.		④ American Concrete and Steel Pipe Company, P.O. Box 1428 Los Angeles, California.		⑤ Coleman Bros. Corp., 245 State St., Boston, Mass.		⑥ J.F. Fitzgerald Construction Co. 214 Essex St., Boston, Mass.	
Item	Description	Unit	Quantity	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	Acre	40	$75.	$3,000.	$150.	$6,000.	$90.	$3,600.	$100.	$4,000.	$100.	$4,000.	$100.	$4,000.
2	Grubbing	Acre	25	100.	2,500.	150.	3,750.	100.	2,500.	125.	3,125.	150.	3,750.	150.	3,750.
3	Stripping	Cu. Yd.	40,000	.45	18,000.	.20	8,000.	.25	10,000.	.18	7,200.	.25	10,000.	.25	10,000.
4	Rough grading for pipe delivery	Sq. Yd.	50,000	.05	2,500.	.05	2,500.	.05	2,500.	.10	5,000.	.13	6,500.	.10	5,000.
5	Earth excavation	Cu. Yd.	180,000	.30	54,000.	.25	45,000.	.50	90,000.	.35	63,000.	.30	54,000.	.40	72,000.
6	Rock excavation	Cu. Yd.	5,000	2.	10,000.	2.	10,000.	2.	10,000.	2.25	11,250.	2.50	12,500.	2.	10,000.
7	Compacted refill and embankment	Cu. Yd.	25,000	.40	10,000.	.50	12,500.	.50	12,500.	.60	15,000.	.60	15,000.	.55	13,750.
8	Refill and embkmt.(except Items 7 and 9)	Cu. Yd.	150,000	.15	22,500.	.20	30,000.	.18	27,000.	.22	33,000.	.20	30,000.	.22	33,000.
9	Misc. unconsolidated embankments	Cu. Yd.	10,000	.15	1,500.	.40	4,000.	.15	1,500.	.20	2,000.	.25	2,500.	.25	2,500.
10	Soil dressing	Cu. Yd.	27,000	.60	16,200.	.70	18,900.	.30	8,100.	.25	6,750.	.60	16,200.	.50	13,500.
11	Seeding and grassing	Acre	25	100.	2,500.	200.	5,000.	150.	3,750.	125.	3,125.	250.	6,250.	200.	5,000.
12	Gravel surfacing for roads	Cu. Yd.	1,000	.50	500.	1.	1,000.	1.	1,000.	1.75	1,750.	1.	1,000.	1.	1,000.
13	Crushed stone and screened gravel	Cu. Yd.	5,000	2.50	12,500.	2.50	12,500.	2.	10,000.	2.50	12,500.	3.	15,000.	2.50	12,500.
14	Paving	Cu. Yd.	500	3.	1,500.	3.	1,500.	4.	2,000.	3.50	1,750.	4.	2,000.	4.	2,000.
15	Riprap	Cu. Yd.	50	5.	250.	3.	150.	3.	150.	3.50	175.	3.50	175.	3.	150.
16	Laying 11'-6" conc. pipe, furnished by Comm.	Lin. Ft.	16,500	6.	99,000.	6.25	103,125.	8.	132,000.	9.	148,500.	9.	148,500.	9.	148,500.
17	Laying 7'-0" conc. pipe, furnished by Comm.	Lin. Ft.	72	6.	432.	6.25	450.	7.	504.	4.	288.	7.	504.	6.	432.
18	Conc. foundations and anchorages for pipe	Cu. Yd.	16,000	4.25	68,000.	5.50	88,000.	4.50	72,000.	5.	80,000.	6.	96,000.	5.40	86,400.
19	Reinforced concrete	Cu. Yd.	700	12.	8,400.	12.	8,400.	14.	9,800.	17.	11,900.	13.	9,100.	15.	10,500.
20	Miscellaneous concrete	Cu. Yd.	250	12.	3,000.	12.	3,000.	12.	3,000.	11.	2,750.	10.	2,500.	16.	4,000.
21	Reinforcing steel	Pound	100,000	.04	4,000.	.045	4,500.	.035	3,500.	.05	5,000.	.04	4,000.	.05	5,000.
22	Portland cement	Barrel	25,000	2.40	60,000.	2.40	60,000.	2.50	62,500.	2.50	62,500.	2.50	62,500.	2.55	63,750.
23	Steel-plate pipe and specials	Pound	100,000	.10	10,000.	.13	13,000.	.10	10,000.	.15	15,000.	.12	12,000.	.15	15,000.
24	Mortar lining for steel pipe	Sq. Ft.	7,000	.45	3,150.	.70	4,900.	.45	3,150.	.25	1,750.	.40	2,800.	.50	3,500.
25	Structural steel	Pound	25,000	.10	2,500.	.08	2,000.	.10	2,500.	.10	2,500.	.06	1,500.	.10	2,500.
26	Galvanizing	Pound	8,000	.03	240.	.05	400.	.04	320.	.03	240.	.05	400.	.05	400.
27	Cast-iron pipe and specials	Pound	150,000	.10	15,000.	.06	9,000.	.06	9,000.	.07	10,500.	.09	13,500.	.07	10,500.
28	Steel castings	Pound	150,000	.10	15,000.	.08	12,000.	.10	15,000.	.20	30,000.	.20	30,000.	.15	22,500.
29	Misc. non-ferrous metals	Pound	100	.60	60.	1.	100.	.50	50.	.40	40.	.50	50.	.50	50.
30	Stone masonry	Cu. Yd.	80	80.	6,400.	60.	4,800.	70.	5,600.	65.	5,200.	70.	5,600.	90.	7,200.
31	Brick masonry	Cu. Yd.	15	50.	750.	60.	900.	30.	450.	37.	555.	35.	525.	50.	750.
32	Rubble masonry	Cu. Yd.	20	10.	200.	15.	300.	10.	200.	5.	100.	10.	200.	10.	200.
33	Cobble gutters	Cu. Yd.	500	4.	2,000.	3.	1,500.	4.	2,000.	5.50	2,750.	5.	2,500.	5.	2,500.
34	Corrugated metal culverts	Pound	10,000	.10	1,000.	.15	1,500.	.11	1,100.	.08	800.	.10	1,000.	.12	1,200.
35	Miscellaneous lumber	M.ft.B.M.	20	100.	2,000.	80.	1,600.	75.	1,500.	90.	1,800.	50.	1,000.	80.	1,600.
36	Tile pipe 8" or less in diameter	Lin. Ft.	500	.50	250.	.60	300.	1.	500.	.75	375.	.50	250.	.50	250.
37	Tile pipe 10" to 18" in diameter	Lin. Ft.	100	2.	200.	2.	200.	1.	100.	1.	100.	1.50	150.	2.	200.
38	Replacing highway pavement	Sq. Yd.	1,000	1.50	1,500.	2.	2,000.	1.50	1,500.	2.50	2,500.	1.50	1,500.	1.50	1,500.
39	Permanent fencing, Type A	Lin. Ft.	35,000	.40	14,000.	.30	10,500.	.35	12,250.	.40	14,000.	.40	14,000.	.40	14,000.
40	Highway crossings	Each	5	400.	2,000.	500.	2,500.	200.	1,000.	250.	1,250.	200.	1,000.	300.	1,500.
41	Setting metal work, furnished by Comm.	Pound	500,000	.02	10,000.	.02	10,000.	.01	5,000.	.03	15,000.	.03	15,000.	.03	15,000.
42	Permanent fencing, Type B	Lin. Ft.	6,000	.25	1,500.	.30	1,800.	.18	1,080.	.20	1,200.	.25	1,500.	.30	1,800.
43	Railroad crossing	Lump sum		1000.	1,000.	2500.	2,500.	3000.	3,000.	900.	900.	2500.	2,500.	1000.	1,000.
44	Cleaning up	Lump sum		1000.	1,000.	1000.	1,000.	6000.	6,000.	1000.	1,000.	1000.	1,000.	1500.	1,500.
	Sub-total (Items 1 to 44 inclusive)				490,032.		511,075.		549,204.		588,123.		609,954.		611,382.
45	Furnishing performance bond-Rate per $1000			15.	7,350.48	15.	7,666.13	15.	8,238.06	15.	8,821.84	15.	9,149.31	15.	9,170.73
	Totals			$497,382.48		$518,741.13		$557,442.06		$596,944.84		$619,103.31		$620,552.73	
	Bid Bond Deposit			$27,500.00		$27,500.00		$27,500.00		$27,500.00		$27,500.00		$27,500.00	

★ Contract awarded April 18, 1939.
Contract executed May 3, 1939.

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 77 received this day by the Metr. Dist. Water Supply Commission.

R Nelson Molt
R. Nelson Molt, Secretary

CANVASS OF BIDS FOR CONTRACT - 78 - OPENED MARCH 9, 1939

COMMONWEALTH OF MASSACHUSETTS
METR DISTR WATER SUPPLY COMMISSION

CONTRACT 78

FOR CONSTRUCTING CUT-AND-COVER AQUEDUCT, SECT 4 OF PRESSURE AQUEDUCT IN THE TOWNS OF FRAMINGHAM AND WAYLAND MASS

PWA DOCKET NO. MASS 1551-F, MASS STATE PROJECT NO D-208

PROPOSAL "A"

No.	Description	Unit	Quantity	CENEDELLA & CO, INC 167 MAIN ST, MILFORD, MASS		CARLO BIANCHI AND COMPANY INC. FRAMINGHAM, MASS		B A GARDETTO, INC BOSTON, MASS		C&R CONSTRUCTION COMPANY 75 BRADEEN ST, ROSLINDALE, MASS		COLEMAN BROS CORP 245 STATE ST, BOSTON, MASS	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	Acre	50	$25 00	$1 250 00	$150	$7 500 00	$75.	$3 750 00	$50	$2 500 00	$100	$5 000. 00
2	Grubbing	Acre	30	100	3 000	150	4 500	140	4 200.	50	1 500	150	4 500
3	Stripping	Cu Yd	50,000	.10	5 000	25	12 500	35	17 500	20	10 000	.50	25 000
4	Rough grading for pipe delivery	Sq Yd	40,000	.05	2 000	05	2 000	05	2 000	04	1 600.	13	5 200
5	Earth excavation	Cu Yd	190,000	22	41 800	30	57 000	35	66 500	56	106 400.	40	76 000
6	Rock excavation	Cu Yd	6,000	.22	1 320	2	12 000	2 25	13 500	56	3 360	1 80	10 600
7	Compacted refill and embankment	Cu Yd	30,000	50	15 000.	60	18 000.	65	19 500	30	9 000.	50	15 000.
8	Refill and embkmt (except Items 7 and 9)	Cu Yd	150,000	23	34 500	25	37 500	18	27 000.	20	30 000	30	45 000
9	Misc unconsolidated embankments	Cu Yd	20,000	.23	4 600.	40	8 000.	.15	3 000	.10	2 000	.30	6 000
10	Soil dressing	Cu Yd	35,000	.23	8 050	75	26 250	.60	21 000.	60	21 000	30	10 500.
11	Seeding and grassing	Acre	40	200.	8 000	200	8 000	150	6 000	200	8 000	200	8 000
12	Gravel surfacing for roads	Cu Yd	1,200	.30	360	1	1 200.	50	600.	1	1 200	50	600
13	Crushed stone and screened gravel	Cu Yd	5,000	1.75	8 750	2.50	12 500.	2 50	12 500	1	5 000	2	10 000
14	Paving	Cu Yd	600	3	1 800.	3	1 800	4	2 400.	5	3 000	3.	1 800
15	Riprap	Cu Yd	500	2	1 000	3	1 500.	2	1 000.	2	1 000.	3.	1 500
16	Laying conc pipe furnished by Comm	Lin Ft	17,800	10	178 000.	5 75	102 350	6.20	110 360.	7 25	129 050	8 98	159 844
17	Setting metal work furnished by Comm.	Pound	10,000	04	400	10	1 000	05	500	05	500	.04	400
18	Conc foundations and anchorages for pipe	Cu Yd	14 000	3.50	49 000	6	84 000.	6.	84 000	6	84 000	5	70 000.
19	Reinforced concrete	Cu Yd	800	12	9 600	12	9 600	14	11 200.	14.	11 200	9.	7 200
20	Miscellaneous concrete	Cu Yd	500	12	6 000	12	6 000	14	7 000.	14	7 000	9	4 500
21	Reinforcing steel	Pound	100,000	05	5 000	04½	4 500	.04	4 000	04	4 000	04	4 000
22	Portland cement	Barrel	24,000	2 30	55 200.	2 40	57 600.	2 50	60 000	2 50	60 000	2 50	60 000
23	Steel-plate pipe and specials	Pound	20,000	14	2 800	.13	2 600.	10	2 000.	.12	2 400	10	2 000
24	Mortar lining for steel pipe	Sq Ft	1,000	30	300	1	1 000	45	450.	45	450	50	500
25	Structural steel	Pound	10,000	10	1 000	08	800	10	1 000	09	900.	05	500
26	Galvanizing	Pound	10,000	05	500	.05	500	04	400	03	300	04	400
27	Cast-iron pipe and specials	Pound	100,000	09	9 000	05	9 000	.08	8 000.	06½	6 500	06	6 000
28	Steel castings	Pound	2,000	20	400	.15	300.	10	200.	20	400	10	200.
29	Misc non ferrous metals	Pound	1,000	.50	500	50	500	70	700.	.50	500.	40	400.
30	Stone masonry	Cu Yd	150	65.	9 750.	40	6 000.	85	12 750.	80	12 000.	60	9 000
31	Brick masonry	Cu. Yd	20	50	600.	60	1 200.	50	1 000	40	800	30	600.
32	Rubble masonry	Cu. Yd	50	10	500	15	750	10	500.	10	500.	10.	500
33	Cobble gutters	Cu Yd	600	6	3 600.	3.	1 800.	4	2 400.	3	1 800.	5.	3 000
34	Corrugated metal culverts	Pound	10,000	12	1 200	.15	1 500	12	1 200	.10	1 000.	.10	1 000.
35	Miscellaneous lumber	M Ft B.M	20	65.	1 300	90	1 800	75.	1 500.	80.	1 600.	100.	2 000.
36	Tile pipe 8" or less in diameter	Lin Ft	2,000	25	500	50	1 000.	.50	1 000.	1.	2 000.	60	1 200
37	Tile pipe 10" to 18" in diameter	Lin Ft	500	1.	500	2	1 000	2	1 000	2.	1 000.	1.	500.
38	Replacing highway pavement	Sq Yd	2,500	1 50	3 750.	1 50	3 750	2.50	6 250.	1.	2 500.	1.	2500.
39	Permanent fencing Type A	Lin. Ft	50,000	.32	16 000	40	20 000	40	20 000.	.42	21 000.	40	20 000
40	Highway Crossings	Each	6	400.	2 400	300	1 800	400.	2400.	500.	3 000.	200.	1 200
41	Sudbury River Crossing	Lump Sum		20000.	20 000	2000	2 000.	1000.	1 000	10 000	10 000	1000.	1 000
42	Clearing up	Lump Sum		2500.	2 500	1000	1000.	1000.	1 000.	1000	1 000.	500.	500.
	Sub-total (Items 1 to 42 inclusive)				$516 730		$533 600		$542 260		$570 960.		$583 844
43	Furnishing performance bond, Rate per $1,000			15	7 750 95	15	8 004	15.	8 133 90	15.	8 564 40	15	8 757 66
	Totals –				$524 480 95		$541 604 00		$550 393 90		$579 524 40		$592 601 66
	Bid Bond Deposit			*	$29 000 00		$29 000.00		$29 000.00		$29 000 00	*	$29 000 00

No.	Description	B PERINI & SONS INC FRAMINGHAM, MASS		VINCENT SCHIAVI 6 WEST NINTH ST, WILMINGTON, DELAWARE		J F FITZGERALD CONSTRUCTION CO 214 ESSEX ST, BOSTON, MASS		THE ARTHUR A JOHNSON CORPORATION AND NECARO CO INC, 23-28 HUNTER ST, LONG ISLAND CITY, NEW YORK	
		Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	$82 50	$4 125 00	$300	$15 000 00	$120	$6 000 00	$87	$4 350 00
2	Grubbing	220	6 600	300	9 000	200	6 000	140	4 200
3	Stripping	25	12 500	36	18 000	30	15 000	06	3 000
4	Rough grading for pipe delivery	04	1 600	.10	4 000	10	4 000	05	2 000
5	Earth excavation	.60	114 000.	36	68 400	40	76 000	12	22 800
6	Rock excavation	60	3 600	3.	18 000	2 25	13 500	2 75	16 500.
7	Compacted refill and embankment	25	7 500	60	18 000	.75	22 500.	.50	15 000.
8	Refill and embkmt (except Items 7 and 9)	25	37 500	21	31 500	25	37 500.	.06	9 000
9	Misc unconsolidated embankments	25	5 000	20	4 000	20	4 000	10	2 000
10	Soil dressing	.65	22 750.	.60	21 000	60	21 000.	.14	4 900.
11	Seeding and grassing	150.	6 000	200	8 000	150	6 000.	133.	5 320.
12	Gravel surfacing for roads	1	1 200.	1	1 200	1	1 200.	78	936
13	Crushed stone and screened gravel	2 50	12 500	3.	15 000	2.50	12 500	1.85	9 250.
14	Paving	4 50	2 700.	4	2 400.	5	3 000.	5.80	3 480.
15	Riprap	3 50	1 750.	3	1 500	3	1 500	1 50	750.
16	Laying conc pipe furnished by Comm	5	160 200.	10.25	182 450.	11.70	208 260.	17 75	315 950.
17	Setting metal work furnished by Comm.	.05	500.	04	400	.05	500.	.05	500.
18	Conc foundations and anchorages for pipe	4 40	61 600.	7.	98 000	6 80	95 200.	4 55	63 700
19	Reinforced concrete	27	21 600.	15	12 000	13	10 400.	11 60	9 280
20	Miscellaneous concrete	18	9 000.	14.	7 000	13	6 500.	10.50	5 250.
21	Reinforcing steel	05	5 000.	04	4 000.	.04	4 000.	.06	6 000.
22	Portland cement	2 75	66 000	2 60	62 400	2 52	60 480.	2 50	60 000.
23	Steel-plate pipe and specials	.15	3 000	14	2 800	12	2 400	21	4 200.
24	Mortar lining for steel pipe	65	650	40	400	30	300.	.52	520
25	Structural steel	15	1 500.	.09	900.	.10	1 000.	.10	1 000
26	Galvanizing	.04	400	.03	300	.04	400.	.06	600.
27	Cast-iron pipe and specials	06	6 000	.09	9 000.	06	6 000.	.09	9 000.
28	Steel castings	10	200	.20	400.	.25	500.	.12	240
29	Misc non ferrous metals	.70	700	60	600.	.60	600.	65	650
30	Stone masonry	60	9 000	75.	11 250	100.	15 000.	105.	15 750.
31	Brick masonry	33.	660	35.	700	60	1 200.	23.60	472
32	Rubble masonry	10	500	12	600.	10	500	14.60	730.
33	Cobble gutters	5 50	3 300	5	3 000	5	3 000	7 30	4 380.
34	Corrugated metal culverts	.12	1 200	.10	1 000	12	1 200.	08	800.
35	Miscellaneous lumber	90.	1 800	85.	1 700	60.	1 200.	102.50	2 050.
36	Tile pipe 8" or less in diameter	40	800	.55	1 100.	45	900	56	1 120
37	Tile pipe 10" to 18" in diameter	1.10	550	1 75	875	1 50	750	1 40	700
38	Replacing highway pavement	1.50	3 750.	1 75	4 375.	1 30	3 250.	2 60	6 500
39	Permanent fencing Type A	40	20 000.	41	20 500.	.37	18 500.	.40	20 000
40	Highway Crossings	1000.	6 000.	500	3 000.	350	2 100.	580	3 480.
41	Sudbury River Crossing	10000	10 000.	1000	1 000.	4500	4 500	49000	49 000.
42	Clearing up	4500	4 500	1000.	1000.	1500.	1 500.	2100	2 100.
	Sub-total (Items 1 to 42 inclusive)		$637 735.		$665 750.		$679 840.		$687 456
43	Furnishing performance bond, Rate per $1,000	15	9 566 02	15	9 986 25	15	10 040.10	15.	10 311 87
	Totals –		$647 301.02		$675 736 25		$689 880.10		$697 769 87
	Bid Bond Deposit		$29 000.00		$29 000.00		$29 000.00		$29 000 00

★ PROPOSAL "B"

Only if bidder is awarded Contract 79

No.	Description	AMERICAN CONCRETE & STEEL PIPE CO PO BOX 1428 ARCADE STA, LOS ANGELES CALIFORNIA		CARLO BIANCHI AND COMPANY INC FRAMINGHAM, MASS		C&R CONSTRUCTION COMPANY 75 BRADEEN ST, ROSLINDALE, MASS		COLEMAN BROS. CORP. 245 STATE ST, BOSTON, MASS		B PERINI & SONS INC FRAMINGHAM, MASS		THE ARTHUR A JOHNSON CORPORATION AND NECARO CO, INC. 23-28 HUNTER ST, LONG ISLAND CITY, NEW YORK	
		Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	$100	$5 000 00	$150.	$7500 00	$50	$2 500 00	$100.	$5 000 00	$82.50	$4 125.00	$84.	$4 200 00
2	Grubbing	125	3 750	150	4 500.	50	1 500	150.	4 500.	220.	6 600.	139	4 170.
3	Stripping	15	7 500	25	12 500	20	10 000	50	25 000.	25	12 500.	06	3 000.
4	Rough grading for pipe delivery	11	4 400.	05	2 000	04	1600.	13	5 200	04	1 600	05	2 000
5	Earth excavation	30	57 000	30	57 000.	.56	106 400	40	76 000	.60	114 000	12	22 800.
6	Rock excavation	2	12 000.	2.	12 000	.56	3 360.	1 80	10 600	60	3 600.	2 76	16 560
7	Compacted refill and embankment	60	18 000	.60	18 000	.30	9 000.	50	15 000.	25	7 500	.50	15 000
8	Refill and embkmt (except Items 7 and 9)	16	24 000.	.25	37 500	.20	30 000.	30	45 000.	25	37 500.	.06	9 000
9	Misc unconsolidated embankments	15	3 000	40	8 000	.10	2 000.	.30	6 000	.25	5 000	.10	2 000.
10	Soil dressing	20	7 000	.75	26 250.	60	21 000.	.30	10 500.	65	22 750.	.14	4 900
11	Seeding and grassing	125.	5 000.	200	8 000	200.	8 000.	200	6 000.	150	6 000	133.	5 320.
12	Gravel surfacing for roads	1.75	2 100.	1	1 200	1.	1 200.	.50	600	1	1 200.	.78	936
13	Crushed stone and screened gravel	2 50	12 500.	2.50	12 500.	1.	5000.	2.	10 000.	2.50	12 500	1 86	9 300
14	Paving	3.50	2 100.	3.	1 800	5.	3000.	3.	1 800.	4 50	2 700.	5 80	3 480
15	Riprap	3 50	1 750.	3.	1 500.	2	1 000.	3.	1 500.	3 50	1 750.	1.54	770.
16	Laying conc pipe furnished by Comm	8	142 400.	5 75	102 350	7 25	129 050.	8.98	159 844.	8.	142 400.	15.35	273 230.
17	Setting metal work furnished by Comm.	.03	300	.10	1 000.	.05	500.	04	400.	.05	500	.05	500
18	Conc foundations and anchorages for pipe	5.	70 000	6	84 000.	6	84 000.	5.	70 000.	4 40	61 600	4 57	63 980
19	Reinforced concrete	16.	12 800	12.	9 600.	14	11 200.	9	7 200.	27	21 600.	11.60	9 280.
20	Miscellaneous concrete	10	5 000.	12.	6 000.	14	7 000.	9	4 500.	18	9 000.	10.40	5 200
21	Reinforcing steel	.04½	4 500.	.04½	4 500	.04	4 000.	04	4 000.	.05	5000.	.06	6 000.
22	Portland cement	2.50	60 000.	2 40	57 600.	2.50	60 000.	2.50	60 000.	2.75	66 000	2 53	60 720.
23	Steel-plate pipe and specials	.15	3 000.	.13	2 600.	12	2 400.	.10	2 000.	.15	3 000	21	4 200.
24	Mortar lining for steel pipe	.25	250.	1.	1 000.	45	450.	.50	500.	65	650	.52	520.
25	Structural steel	.10	1 000	.08	800.	.09	900	05	500	15	1 500	10	1 000.
26	Galvanizing	.03	300.	.05	500.	.03	300.	04	400	04	400.	.06	600
27	Cast-iron pipe and specials	.07	7 000.	.09	9 000	.06½	6 500.	.06	6 000.	06	6 000	09	9 000.
28	Steel castings	20	400.	15	300	.20	400	10	200.	.10	200	.12	240.
29	Misc non ferrous metals	.35	350.	.50	500.	.50	500	40	400	70	700.	.65	650.
30	Stone masonry	65.	9 750.	40	6000.	80.	12 000.	60.	9 000.	60	9 000.	107.	16 050.
31	Brick masonry	37.	740.	60	1 200.	40.	800.	30.	600.	33.	660	23.60	472.
32	Rubble masonry	5.50	275.	15.	750	10.	500.	10.	500.	10.	500	14.60	730
33	Cobble gutters	5 50	3 300.	3.	1 800	3.	1 800.	5.	3 000.	5.50	3 300	7.30	4 380.
34	Corrugated metal culverts	.08	800.	.15	1 500.	10	1 000	.10	1 000.	12	1 200.	.08	800
35	Miscellaneous lumber	90.	1 800.	90	1 800.	80	1 600.	100.	2 000.	90	1 800.	105.	2 100.
36	Tile pipe 8" or less in diameter	.75	1 500.	.50	1 000.	1	2 000.	60	1 200.	40	800	56	1 120.
37	Tile pipe 10" to 18" in diameter	2	1 000.	2	1 000.	2.	1 000.	1.	500.	1.10	550	1.42	710.
38	Replacing highway pavement	2 75	6 875	1.50	3 750	1.	2500.	1.	2 500.	1 50	3 750.	2 62	6 550.
39	Permanent fencing Type A	40	20 000	40	20 000.	.42	21 000.	.40	20 000	40	20 000.	.39	19 500
40	Highway Crossings	250.	1 500.	300.	1 800.	500.	3000.	200	1 200.	1000	6 000.	580	3 480
41	Sudbury River Crossing	6 700.	6 700.	2000.	2000.	10000.	10 000.	1000.	1 000	10000.	10 000	47000.	47 000.
42	Clearing up	1000.	1 000.	1000	1000	1000.	1 000.	500.	500.	4500.	4 500	2100.	2 100.
	Sub-total (Items 1 to 42 inclusive)		$527 640.		$533 600.		$570 960.		$583 844.		$619 935.		$643 548
43	Furnishing performance bond, Rate per $1,000	15	7 914.60	15	8004	15	8 564.40	15	8 757.66	15.	9 299 02	15.	9 653 22
	Totals –		$535 554 60		$541 604.00		$579 524.40		$592 601.66		$629 234 02		$653 201.22
	Bid Bond Deposit		$29 000 00		$29 000.00		$29 000.00	*	$29 000 00		$29 000 00		$29 000.00

I certify the foregoing to be a true and accurate summary of all bids on the above Contract 78 received this day by the Metr Dist Water Supply Commission

R Nelson Molt
R Nelson Molt Secretary

Note
* Indicates certified check

★ Contract awarded March 18, 1939
Contract executed March 20, 1939

CANVASS OF BIDS FOR CONTRACT 79 — OPENED MARCH 9, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DIST. WATER SUPPLY COMMISSION

CONTRACT 79

FOR CONSTRUCTING CUT-AND COVER AQUEDUCT, SECT 5, OF PRESSURE AQUEDUCT, IN THE TOWNS OF WAYLAND, NATICK AND WESTON, MASS
P.W.A. DOCKET NO MASS. 1551F, MASS. STATE PROJECT NO Q.208

				PROPOSAL "A"										★ PROPOSAL "B" *Only if bidder is awarded Contract 78*											
				Carlo Bianchi & Company, Inc Framingham, Mass.		Coleman Bros Corp. 245 State Street Boston, Mass		C&R Construction Co 75 Bradeen, St Roslindale, Mass		The Arthur A Johnson Corporation Necaro Co, Inc 29 28 Hunter Street Long Island City, New York		B Perini & Sons Inc Framingham, Mass		American Concrete & Steel Pipe Co P O Box 1428 Arcade Station Los Angeles, California		Carlo Bianchi & Company, Inc Framingham, Mass.		C & R Construction Co. 75 Bradeen St., ROSLINDALE, MASS		Coleman Bros Corp 245 State Street Boston, Mass		The Arthur A Johnson Corporation Necaro Co, Inc 29-28 Hunter Street, Long Island City, New York		B Perini & Sons Inc Framingham, Mass	
ITEM	DESCRIPTION	UNIT	QUAN.	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	*Clearing*	Acre	50	$150	$7,500	$100	$5,000	$50	$2,500	$86	$4,300	$100	$5,000	$100.	$5,000.	$150	$7,500	$50	$2,500.	$100	$5,000	$86	$4,300.	$100	$5,000
2	*Grubbing*	Acre	30	150.	4,500	150	4,500	50	1,500	141.	4,230	220	6,600	125	3,750	150	4,500	50	1,500	150	4,500	140	4,200.	220.	6,600
3	*Stripping*	Cu Yd	50,000	0.25	12,500.	50	25,000	20	10,000	0.06	3,000.	25	12,500	15	7,500	.25	12,500	20	10,000.	0 50	25,000.	06	3,000.	25	12,500.
4	*Rough grading for pipe delivery*	Sq Yd	40,000	0.05	2,000	13	5,200	04	1,600.	0.05	2,000	05	2,000.	.11	4,400	05	2,000	04	1,600	13	5,200	05	2,000.	05	2,000.
5	*Earth excavation*	Cu Yd	180,000	0.30	54,000	.40	72,000.	.50	90,000	0 18	32,400	68	122,400.	30	54,000	30	54,000	50	90,000.	40	72,000	.17	30,600.	68	122,400
6	*Rock excavation*	Cu Yd	10,000	2	20,000	1.80	18,000	2 50	25,000	2.81	28,100	68	6,800	2	20,000	2	20,000	2 50	25,000.	1 80	18,000	2.80	28,000.	.68	6,800.
7	*Compacted refill and embankment*	Cu Yd	30,000	0 60	18,000.	50	15,000	30	9,000.	0.52	15,600	25	7,500	.60	18,000	60	18,000.	30	9,000	50	15,000	52	15,600	25	7,500
8	*Refill and emb'km't (except items 7-9)*	Cu Yd.	150,000	30	45,000	.30	45,000	30	45,000	0 05	7,500	.25	37,500	16	24,000	25	37,500	30	45,000	30	45,000	05	7,500	25	37,500.
9	*Misc unconsolidated emb'km'ts*	Cu Yd	20,000	.40	8,000	.30	6,000	.10	2,000	0.10	2,000.	25	5,000	15	3,000	40	8,000	10	2,000.	30	6,000.	10	2,000.	25	5,000.
10	*Soil dressing*	Cu Yd	35,000	.75	26,250	30	10,500	60	21,000	0.22	7,700.	65	22,750	20	7,000.	75	26,250	60	21,000	30	10,500	.22	7,700.	.65	22,750.
11	*Seeding and grassing*	Acre	40	200	8,000	200.	8,000.	200	8,000	136	5,440.	150.	6,000.	125	5,000	200	8,000	200	8,000.	200	8,000	135	5,400	150.	6,000.
12	*Gravel surfacing for roads*	Cu Yd	1,200	1.	1,200.	.50	600.	1	1,200	0 80	960	85	1,020.	1.75	2,100	1	1,200	1	1,200	50	600.	80	960	.85	1,020.
13	*Crushed stone and screened gravel*	Cu Yd	5,000	2 50	12,500.	2	10,000	1	5,000	1.89	9,450	2 20	11,000.	2 50	12,500	2 50	12,500	1	5,000.	2	10,000.	1 88	9,400	2 20	11,000.
14	*Paving*	Cu Yd	600	3	1,800.	3.	1,800.	5	3,000	5 90	3,540	4.40	2,640	3.50	2,100	3	1,800	5	3,000	3	1,800.	5.90	3,540.	4.40	2,640
15	*Riprap*	Cu. Yd.	500	3	1,500.	3.	1,500.	2	1,000.	1 57	785	3.30	1,650	3 50	1,750	3	1,500	2	1,000	3.	1,500.	1.56	780.	3.30	1,650.
16	*Laying conc pipe furn. by Commission*	Lin Ft	18,000	6 25	112,500	8.98	161,640.	8.10	145,800	17.50	315,000.	12 07	217,260	8	144,000	5.75	103,500.	7 10	127,800.	8 98	161,640	15.25	274,500.	11.	198,000.
17	*Setting metal work furn by Commission*	Pound	10,000	0 10	1,000	04	400.	05	500.	0.05	500	.05	500	.03	300	.10	1,000	05	500.	04	400	.05	500.	05	500.
18	*Conc foundations and anchorages for pipe*	Cu Yd	15,000	6	90,000	5	75,000.	6	90,000	4 65	69,750	4.40	66,000	5.	75,000	6	90,000.	6	90,000.	5	75,000.	4 65	69,750	4.40	66,000
19	*Reinforced concrete*	Cu Yd	800	12	9,600	9	7,200	14	11,200.	12.10	9,680.	27	21,600	16.	12,800	12	9,600	14	11,200	9	7,200	12	9,600	27.	21,600
20	*Miscellaneous concrete*	Cu Yd	500	12	6,000	9	4,500.	14	7,000.	10.70	5,350	18.20	9,100.	10.	5,000	12	6,000	14	7,000	9	4,500	10 60	5,300.	18 20	9,100
21	*Reinforcing steel*	Pound	100,000	0.045	4,500	.04	4,000	.04	4,000	0.06	6,000	.043	4,300	045	4,500.	045	4,500.	04	4,000	.04	4,000	06	6,000	.043	4,300.
22	*Portland cement*	Barrel	25,000	2.40	60,000.	2 50	62,500.	2 50	62,500.	2.60	65,000.	2.75	68,750	2.50	62,500.	2 40	60,000	2 50	62,500	2 50	62,500	2.57	64,250	2.75	68,750.
23	*Steel-plate pipe and specials*	Pound	20,000	0.13	2,600	10	2,000.	12	2,400.	0.21	4,200	.14	2,800	.15	3,000	.13	2,600.	.12	2,400.	10	2,000	.21	4,200.	.14	2,800
24	*Mortar lining for steel pipe*	Sq. Ft.	1,000	1	1,000	.50	500	.45	450	0.55	550	66	660	25	250.	1.	1,000.	45	450.	50	500.	.53	530	66	660.
25	*Structural steel*	Pound	10,000	.08	800	.05	500	.09	900.	0.10	1,000	14	1,400	.10	1,000.	08	800	09	900.	05	500.	.10	1,000	.14	1,400
26	*Galvanizing*	Pound	10,000	0.05	500	.04	400	03	300	0.06	600	04	400	03	300.	.05	500	.03	300	04	400.	06	600	.04	400
27	*Cast-iron pipe and specials*	Pound	30,000	0.09	2,700	.06	1,800.	08	2,400	0.12	3,600	.08	2,400	.07	2,100.	.09	2,700.	08	2,400.	06	1,800	.12	3,600	.08	2,400.
28	*Steel casting*	Pound	2,000	0.15	300.	10	200.	20	400.	0 13	260.	.10	200.	.20	400	15	300	.20	400.	10	200	12	240.	10	200
29	*Misc non-ferrous metal*	Pound	1,000	.50	500	40	400.	.50	500.	0 67	670	.66	660	35	350	50	500	.50	500	.40	400	.66	660	66	660.
30	*Stone masonry*	Cu Yd	150	40	6,000	60.	9,000.	80.	12,000.	109.	16,350.	60.50	9,075	65.	9,750	40.	6,000.	80.	12,000.	60.	9,000	108	16,200.	60.50	9,075.
31	*Brick masonry*	Cu Yd	20	60.	1,200.	30	600	40.	800.	24.10	482.	36.30	726	37.	740	60	1,200	40	800.	30.	600	24	480.	36.30	726
32	*Rubble masonry*	Cu Yd	50	15	750.	10	500.	10.	500.	15.	750	10	500	5 50	275	15	750.	10.	500.	10.	500	14 90	745.	10.	500
33	*Cobble gutters*	Cu Yd.	600	3	1,800	5.	3,000.	3.	1,800	7.45	4,470	5.50	3,300	5.50	3,300.	3	1,800.	3.	1,800.	5.	3,000	7 40	4,440	5 50	3,300.
34	*Corrugated metal culverts*	Pound	10,000	.15	1,500	10	1,000.	10	1,000.	0.08	800	.115	1,150.	.08	800.	15	1,500	10	1,000.	.10	1,000.	08	800	.115	1,150.
35	*Miscellaneous lumber*	M ft B M	20	90	1,800.	100	2,000	80	1,600.	105	2,100.	88	1,760	90.	1,800.	90	1,800	80.	1,600.	100	2,000.	104	2,080.	88.	1,760
36	*Tile pipe 8" or less in diameter*	Lin Ft	2,000	0.50	1,000	60	1,200.	1.	2,000.	0 57	1,140	.35	700.	.75	1,500.	.50	1,000	1	2,000.	.60	1,200	.57	1,140	35	700.
37	*Tile pipe 10" to 18" in diameter*	Lin. Ft	500	2	1,000	1.	500	2	1,000	1 45	725	1.05	525.	2.	1,000	2.	1,000	2.	1,000.	1	500	1 44	720	1.05	525
38	*Replacing highway pavement*	Sq. Yd	2,000	1.50	3,000	1.	2,000	1	2,000.	2 70	5,400.	1.40	2,800	2 75	5,500	1.50	3,000	1	2,000.	1.	2,000.	2.66	5,320.	1.40	2,800
39	*Permanent fencing, Type A.*	Lin Ft	50,000	.40	20,000	.40	20,000	.42	21,000	0 40	20,000	.40	20,000.	.40	20,000	.40	20,000	.42	21,000.	.40	20,000	.40	20,000.	40	20,000.
40	*Highway crossings*	Each	5	500.	2,500	200	1,000.	500	2,500	590.	2,950	550.	2,750.	250.	1,250	500.	2,500.	500.	2,500	200	1,000	590	2,950.	550.	2,750.
41	*Dudley Pond Outlet Crossing*	Lump Sum		500	500.	500.	500.	5,000	5,000.	3,000.	3,000.	1,650.	1,650.	500	500.	500	500.	5,000.	5,000.	500	500.	3500.	3,500.	1,650	1,650
42	*Cleaning up*	Lump Sum		1,000.	1,000.	500.	500.	1,000	1,000.	2,150	2,160.	2,200.	2,200.	1,000.	1,000.	1,000	1,000.	1,000	1,000	500.	500.	2140	2,140	2,200.	2,200
	Sub-total, (Items 1 to 42 inclusive)			—	556,800.00	—	590,940.00	—	606,350.	—	669,482.[illegible]	—	693,526.00	—	529,015.00	—	540,300.00	—	588,350.	—	590,940.00	—	626,225.00	—	674,266.00
43	*Furnishing Performance Bond — Rate per $1000*			15.	8,352.00	15	8,864.10	5.	8,870.[illegible]	15.	10,042.[illegible]	15	10,402.89	15	7,935.22	15.	8,104.50	16.	8,600.25	15	8,864.10	15.	9,393.38	15	10,113.99
	Totals				$565,152.00		$599,804.10		$615,220.2[illegible]		$679,524.[illegible]		$703,928.89		$536,950.22		$548,404.50		$596,950.25		$599,804.10		$635,618.38		$684,379.99
	Bid Bond Deposit				$ 29,000.00	*	$ 29,000.00		$ 29,000.00		$ 29,000.00		$ 29,000.00		$ 29,000.00		$29,000.00		$ 29,000.00	*	$ 29,000.00		$ 29,000.00		$ 29,000.00

** Certified Check*

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No 79 received this day by the Metr. Distr. Water Supply Commission.

R Nelson Molt
R NELSON MOLT Secretary

★ *Contract awarded March 18, 1939*
Contract executed March 20, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMM.

CONTRACT 80

FOR
CONSTRUCTING THE HIGH LEVEL DISTRIBUTION RESERVOIR
IN THE TOWN OF WESTON, MASSACHUSETTS
P.W.A. DOCKET NO. MASS. 1551F — MASS. STATE PROJECT NO. D-208
ITEM B

CANVASS OF BIDS FOR CONTRACT 80 ~ OPENED JUNE 1, 1939

				★ ① Carlo Bianchi & Company Inc., 24 Union Ave., Framingham, Mass.		② Coleman Bros. Corp. 245 State St., Boston, Mass.		③ J.F. Fitzgerald Const. Co., 214 Essex St., Boston, Mass.		④ B.A. Gardetta Inc., 123 Terrace St., Roxbury Crossing, Mass.		⑤ M.F. Gadois Inc. 6 Beacon St., Boston, Mass.		⑥ C. & R. Construction Co. 75 Bradeen St., Roslindale, Mass.	
Item No's.	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Clearing	70	Acre	\$150.	\$10,500.	\$200.	\$14,000.	\$200.	\$14,000.	\$100.	\$7000.	\$100.	\$7000.	\$90.	\$6,300.
2	Grubbing	20	Acre	200.	4,000.	200.	4,000.	200	4,000.	150.	3,000.	150.	3,000.	150.	3,000.
3	Stripping	100,000	Cu.Yd.	.30	30,000.	.28	28,000.	.40	40,000.	.40	40,000.	.20	20,000.	.50	50,000.
4	Earth Excavation	200,000	Cu.Yd.	.30	60,000.	.20	40,000.	.30	60,000.	.45	90,000.	.65	130,000.	.80	160,000.
5	Rock Excavation, Blasting Permitted	10,000	Cu.Yd.	2.	20,000.	1.50	15,000.	2.	20,000.	2.	20,000.	2.	20,000.	3.00	30,000.
6	Rock Excavation, Blasting not Permitted	1,000	Cu.Yd.	8.	8,000.	7.	7000.	7.	7000.	10.	10000.	10.	10,000.	8.	8,000.
7	Consolidated pervious embankments	40,000	Cu.Yd.	.20	8,000.	.33	13,200.	.30	12,000.	.65	26,000.	.18	7,200.	.30	12,000.
8	Rolled Semi-impervious embankment	25,000	Cu.Yd.	.20	5,000.	.40	10,000.	.40	10,000.	.25	6,250.	.18	4,500.	.60	15,000.
9	Rolled impervious embankment	60,000	Cu.Yd.	.40	24,000.	.40	24,000.	.55	33,000.	.15	9,000.	.60	36,000.	1.	60,000.
10	Miscellaneous consolidated embankments	200	Cu.Yd.	.50	100.	1.	200.	.30	60.	1.	200.	1.	200.	1.	200.
11	Miscellaneous unconsolidated embankments	7,500	Cu.Yd.	.50	3,750.	.25	1,875.	.25	1,875.	.15	1,125.	.12	900.	.50	3,750.
12	Soil dressing	3,000	Cu.Yd.	1.	3,000.	.80	2,400.	.60	1,800.	1.20	3,600.	.30	900.	1.	3,000.
13	Seeding and grassing	4	Acre	300.	1,200.	400.	1,600.	250.	1,000.	100.	400.	200.	800.	200.	800.
14	Gravel surfacing for roads.	3,500	Cu.Yd.	1.	3,500.	.75	2,625.	1.	3,500.	.80	2800.	1.	3,500.	1.	3,500.
15	Crushed stone and screened gravel	5,000	Cu.Yd.	2.50	12,500.	3.50	17,500.	2.25	11,250.	2.50	12,500.	2.50	12,500.	2.	10,000.
16	Paving	200	Cu.Yd.	3.	600.	4.	800.	3.	600.	4.	800.	3.	600.	5.	1,000.
17	Riprap	10,000	Cu.Yd.	2.	20,000.	3.	30,000.	2.50	25,000.	2.50	25000.	3.	30,000.	2.50	25,000.
18	Laying 11'-6" concrete pipe furnished by Comm.*	175	Lin.Ft.	10.	1,750.	15.	2,625.	12.	2,100.	10.	1,750.	18.	3,150.	15.	2,625.
19	Constructing 8'-6" twin line concrete aqueduct	1,075	Lin.Ft.	96.	103,200.	95.	102,125.	85.	91,375.	80.	86,000.	120.	129,000.	85.	91,375.
20	Miscellaneous concrete	3,000	Cu.Yd.	5.50	16,500.	9.50	28,500.	6.	18,000.	7.	21,000.	15.	45,000.	10.	30,000.
21	Reinforced concrete	1,800	Cu.Yd.	12.	21,600.	12.	21,600.	13.	23,400.	14.	25,200.	15.	27,000.	15.	27,000.
22	Sand for grout	400	Ton	1.50	600.	2.	800.	2.	800.	1.	400.	1.	400.	2.	800.
23	Reinforcing steel	110,000	Pound	.04	4,400.	.04	4,400.	.04	4400.	.04	4,400.	.05	5,500.	.03½	3,850.
24	Portland cement	15,000	Barrel	2.35	35,250.	2.50	37,500.	2.55	38,250.	2.50	37500.	2.50	37,500.	2.70	40,500.
25	Steel-plate pipe and specials	50,000	Pound	.10	5,000.	.10	5,000.	.12	6,000.	.11	5,500.	.12	6,000.	.13	6,500.
26	Mortar lining for steel pipe	3,000	Sq.Ft.	.60	1,800.	.40	1,200.	.35	1,050.	.40	1,200.	.50	1,500.	.50	1,500.
27	Structural steel	40,000	Pound	.08	3,200.	.06	2,400.	.07	2,800.	.11	4400.	.08	3,200.	.08	3,200.
28	Galvanizing	8,000	Pound	.20	1,600.	.30	2,400.	.04	320.	.04	320.	.03½	280.	.04	320.
29	Cast-iron pipe and fittings	30,000	Pound	.06	1,800.	.05	1,500.	.05	1,500.	.07	2,100.	.08	2400.	.07	2,100.
30	Miscellaneous cast-iron	45,000	Pound	.08	3,600.	.05	2,250.	.09	4,050.	.08	3600.	.08	3,600.	10.	4,500
31	Miscellaneous cast-steel	1,000	Pound	.10	100.	.10	100.	.20	200.	.20	200.	.20	200.	.20	200.
32	Miscellaneous iron and steel	25,000	Pound	.10	2,500.	.08	2,000.	.15	3,750.	.13	3,250.	.14	3,500.	.15	3,750.
33	Miscellaneous non-ferrous metals	4,000	Pound	.50	2,000.	.50	2,000.	.50	2,000.	.60	2,400.	.50	2,000.	.50	2,000.
34	Setting metal work furnished by Commission*	8,000	Pound	.05	400.	.02	160.	.04	320.	.10	800.	.02	160.	.05	400.
35	Stone masonry	140	Cu.Yd.	60.	8,400.	60.	8,400.	84.	11,760.	85.	11,900.	75.	10,500.	80.	11,200.
36	Face block masonry	50	Cu.Yd.	75.	3,750.	60.	3,000.	50.	2,500.	100.	5,000.	50.	2,500.	40.	2,000.
37	Brick masonry	25	Cu.Yd.	70.	1,750.	40.	1,000.	50.	1,250.	50.	1,250.	35.	875.	40.	1,000.
38	Drilling holes in rock and masonry	10,000	Lin.Ft.	.30	3,000.	.50	5,000.	.60	6,000.	.50	5,000.	.70	7,000.	.50	5,000.
39	Furnishing and placing grout	1,000	Cu.Yd.	7.50	7,500.	5.	5,000.	4.25	4,250.	8.	8,000.	10.	10,000.	10.	10,000.
40	Preparing rock surfaces	4,000	Sq.Yd.	.25	1,000.	1.	4,000.	1.	4,000.	1.	4000.	3.75	15,000.	.50	2,000.
41	Tile pipe 8" or less in diameter	200	Lin.Ft.	.60	120.	.50	100.	.50	100.	1.	200.	.50	100.	2.	400.
42	Tile pipe 10" to 18" in diameter	100	Lin.Ft.	2.	200.	2.	200.	2.	200.	2.	200.	1.50	150.	5.	500.
43	Reinforced concrete pipe 18" in diameter	125	Lin.Ft.	2.50	312.50	3.	375.	3.	375.	3.	375.	2.	250.	4.	500.
44	Miscellaneous lumber	5	M.Ft.B.M.	80.	400.	50.	250.	120.	600.	100.	500.	150.	750.	100.	500.
45	Permanent fencing, Type C	13,000	Lin.Ft.	1.05	13,650.	1.25	16,250.	1.15	14,950.	1.25	16,250.	1.25	16,250.	1.10	14,300.
46	Boulder guard rail	1,000	Lin.Ft.	.50	500.	1.	1,000.	3.	3,000.	1.	1,000.	.50	500.	.50	500.
47	Rubble masony	200	Cu.Yd.	10.	2,000.	8.	1,600.	6.	1,200.	10.	2,000.	15.	3,000.	8.	1,600.
48	Cobble gutters	100	Cu.Yd.	5.	500.	4.	400.	5.	500.	4.	400.	5.	500.	5.	500.
49	Electrical work		Lump Sum	1500.	1,500.	1700.	1,700.	850.	850.	5000.	5,000.	4,000.	4,000.	1,800.	1,800.
50	Gate house, compensation under other items		Lump Sum	5000.	5,000.	7500.	7,500.	7,500.	7,500.	10,000.	10,000.	9,000.	9,000.	7,500.	7,500.
51	Pond and swamp drainage control		Lump Sum	1500.	1,500.	1000.	1,000.	5200.	5,200.	15000.	15,000.	500.	500.	2,000.	2,000.
52	Cleaning up		Lump Sum	1000.	1,000.	500.	500.	2,000.	2,000.	1,000.	1,000.	1,000.	1,000.	1,000.	1,000.
	Sub-Total (Items 1 to 52 inclusive)				\$471,532.50		\$486,035.00		\$511,635.00		\$544,770.00		\$639,365.00		\$674,470.08
53	Furnishing Performance Bond - Rate Per \$1000			15.	7,072.99	15.	7,290.52	15.	7,674.53	15.	8,171.55	15.	9,590.46	15.	10,117.05
	Totals				\$478,605.49		\$493,325.52		\$519,309.53		\$552,941.55		\$648,955.48		\$684,587.05
	Bid Bond Deposit				\$22,500.00		\$22,500.00		\$22,500.00		\$22,500.00		\$22,500.00		\$22,500.00

* Precast pipe & metal work are furnished by the Commission.

★ Contract executed = June 15, 1939
Contract awarded = June 1, 1939

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 80 received this day by the Metr. Dist. Water Supply Commission.

R. Nelson Molt Secretary

CANVASS OF BIDS FOR CONTRACT 81 — OPENED APRIL 13, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 81

FOR CONSTRUCTING CUT-AND-COVER AQUEDUCT SECT. 6
OF PRESSURE AQUEDUCT IN THE TOWN OF WESTON
MASSACHUSETTS

P.W.A. DOCKET NO. MASS. 1551-F MASS. STATE PROJECT NO. D-208

				★ ① M. F. Gaddis Inc. 6 Beacon St., Boston, Mass.		② Carlo Bianchi & Company Inc., 24 Union Ave., Framingham, Mass.		③ C & R Construction Co., 75 Bradeen St., Roslindale, Mass.		④ American Concrete and Steel Pipe Company P.O. Box 1428, Arcade Sta. Los Angeles, California.		⑤ J. F. Fitzgerald Const. Co., 214 Essex St., Boston, Mass.		⑥ Coleman Bros. Corp. 245 State St., Boston, Mass.	
Item	Description	Unit	Quantity	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	*Clearing*	Acre	35	$100.	$3,500.	$150.	$5,250.	$90.	$3,150.	$100.	$3,500.	$100.	$3500.	$100.	$3,500.
2	*Grubbing*	Acre	20	150.	3,000.	150.	3,000.	90.	1,800.	125.	2,500.	200.	4000.	100.	2,000.
3	*Stripping*	Cu. Yd.	45,000	.20	9,000.	.20	9,000.	.30	13,500.	.18	8,100.	.25	11,250.	.25	11,250.
4	*Rough grading for pipe delivery*	Sq. Yd.	40,000	.05	2,000.	.05	2,000.	.04	1,600.	.13	5,200.	.10	4,000.	.15	6,000.
5	*Earth excavation*	Cu. Yd.	200,000	.30	60,000.	.25	50,000.	.40	80,000.	.40	80,000.	.35	70,000.	.48	96,000.
6	*Rock excavation*	Cu. Yd.	20,000	2.	40,000.	2.	40,000.	2.	40,000.	2.	40,000.	2.50	50,000.	3.	60,000.
7	*Compacted refill and embankment*	Cu. Yd.	25,000	.50	12,500.	.50	12,500.	.50	12,500.	.65	16,250.	.50	12,500.	.70	17,500.
8	*Refill and embkmt. (except Items 7 and 9)*	Cu. Yd.	130,000	.12	15,600.	.20	26,000.	.20	26,000.	.21	27,300.	.20	26,000.	.20	26,000.
9	*Misc. unconsolidated embankments.*	Cu. Yd.	25,000	.12	3,000.	.40	10,000.	.15	3,750.	.20	5,000.	.25	6,250.	.25	6,250.
10	*Soil dressing*	Cu. Yd.	30,000	.30	9,000.	.80	24,000.	.30	9,000.	.25	7,500.	.60	18,000.	1.	30,000.
11	*Seeding and grassing*	Acre	30	200.	6,000.	200.	6,000.	150.	4,500.	125.	3,750.	200.	6000.	250.	7,500.
12	*Gravel surfacing for roads*	Cu. Yd.	2,000	1.	2,000.	1.	2,000.	1.	2,000.	1.75	3,500.	1.	2,000.	1.	2,000.
13	*Crushed stone and screened gravel*	Cu. Yd.	5,000	1.50	7,500.	3.	15,000.	2.50	12,500.	2.50	12,500.	2.25	11,250.	3.	15,000.
14	*Paving*	Cu. Yd.	500	3.	1,500.	3.	1,500.	4.	2,000.	3.50	1,750.	4.	2,000.	4.	2,000.
15	*Riprap*	Cu. Yd.	3,000	3.	9000.	3.	9000.	2.	6,000.	3.50	10,500.	3.	9,000.	3.50	10,500.
16	*Care for & lay 11'-6" precast concrete pipe.* *	Lin. Ft.	15,400	9.	138,600.	6.25	96,250.	8.	123,200.	9.	138,600.	8.55	131,670.	9.	138,600.
17	*Care for & lay 7'-0" precast concrete pipe.* *	Lin. Ft.	2,300	7.	16,100.	6.25	14,375.	7.	16,100.	4.	9,200.	4.	9,200.	7.	16,100.
18	*Conc. foundations and anchorages for pipe*	Cu. Yd.	14,000	5.	70,000.	6.	84,000.	5.	70,000.	5.50	77,000.	5.75	80,500.	6.	84,000.
19	*Reinforced concrete*	Cu. Yd.	900	14.70	13230.	12.	10,800.	14.	12,600.	16.50	14,850.	14.	12,600.	13.	11,700.
20	*Miscellaneous concrete*	Cu. Yd.	300	15.	4,500.	12.	3,600.	12.	3,600.	10.50	3,150.	15.	4,500.	10.	3,000.
21	*Reinforcing steel*	Pound	120,000	.04	4,800.	.045	5,400.	.035	4,200.	.045	5,400.	.06	7,200.	.04	4,800.
22	*Portland cement*	Barrel	25,000	2.48	62,000.	2.45	61,250.	2.60	65,000.	2.50	62,500.	2.55	63,750.	2.50	62,500.
23	*Steel-plate pipe and specials*	Pound	100,000	.08	8,000.	.13	13,000.	.11	11,000.	.15	15,000.	.15	15,000.	.10	10,000.
24	*Mortar lining for steel pipe*	Sq. Ft.	5,000	.37	1,850.	.75	3,750.	.50	2,500.	.25	1,250.	.35	1,750.	.50	2,500.
25	*Structural steel*	Pound	30,000	.09	2,700.	.08	2,400.	.07	2,100.	.10	3,000.	.08	2,400.	.06	1,800.
26	*Galvanizing*	Pound	8,000	.03	240.	.05	400.	.04	320.	.03	240.	.05	400.	.05	400.
27	*Cast-iron pipe and specials*	Pound	200,000	.05	10,000.	.07	14,000.	.09	18,000.	.07	14,000.	.07	14,000.	.06	12,000.
28	*Steel castings*	Pound	35,000	.20	7,000.	.15	5,250.	.20	7,000.	.20	7,000.	.15	5,250.	.10	3,500.
29	*Misc. non-ferrous metals*	Pound	1,000	.40	400.	.50	500.	.50	500.	.35	350.	.75	750.	.50	500.
30	*Stone masonry*	Cu. Yd.	100	74.	7400.	60.	6,000.	90.	9,000.	65.	6,500.	90.	9,000.	65.	6,500.
31	*Brick masonry*	Cu. Yd.	20	27.	540.	60.	1,200.	30.	600.	37.	740.	45.	900.	30.	600.
32	*Rubble masonry*	Cu. Yd.	50	15.	750.	15.	750.	10.	500.	5.50	275.	8.	400.	10.	500.
33	*Cobble gutters*	Cu. Yd.	500	5.	2,500.	3.	1,500.	5.	2,500.	5.50	2,750.	5.	2,500.	5.	2,500.
34	*Corrugated metal culvert*	Pound	10,000	.11	1,100.	.15	1,500.	.11	1,100.	.08	800.	.12	1,200.	.10	1,000.
35	*Miscellaneous lumber*	M.Ft. B.M.	20	75.	1,500.	90.	1,800.	80.	1,600.	90.	1,800.	85.	1,700.	50.	1,000.
36	*Tile pipe 8" or less in diameter*	Lin. Ft.	2,000	.50	1,000.	.50	1,000.	1.	2,000.	.75	1,500.	.50	1,000.	.50	1,000.
37	*Tile pipe 10" to 18" in diameter*	Lin. Ft.	500	1.50	750.	2.	1,000.	1.	500.	2.	1,000.	2.	1,000.	1.50	750.
38	*Replacing highway pavement*	Sq. Yd.	2,500	1.50	3,750.	1.50	3,750.	1.50	3,750.	2.75	6,875.	1.75	4,375.	1.50	3,750.
39	*Permanent fencing, Type A*	Lin. Ft.	12,000	.32	3,840.	.40	4,800.	.40	4,800.	.40	4,800.	.50	6,000.	.40	4,800.
40	*Highway crossings*	Each	10	200.	2,000.	500.	5,000.	500.	5,000.	250.	2,500.	500.	5,000.	200.	2,000.
41	*Care for & set metal work.* *	Pound	200,000	.015	3,000.	.02	4,000.	.03	6,000.	.03	6,000.	.05	10,000.	.03	6,000.
42	*Cleaning up*	Lump Sum		1,000.	1,000.	1,000.	1,000.	1,000.	1,000.	1,000.	1,000.	2,000.	2,000.	500.	500.
	Sub-total (Items 1 to 42 inclusive)				552,150.00		563,525.00		592,770.00		615,430.00		629,795.00		677,800.00
43	*Furnishing performance bond, Rate per $1,000.*			15.	8,282.25	15.	8,452.88	15.	8,891.55	15.	9,231.45	15.	9,446.93	15.	10,167.00
	Totals				$560,432.25		$571,977.88		$601,661.55		$624,661.45		$639,241.93		$687,967.00
	Bid Bond Deposit			**	$27,500.00		$27,500.00		$27,500.00		$27,500.00		$27,500.00		$27,500.00

**Precast pipes & metal work are furnished by the Commission.*

***Certified check.*

I certify the foregoing to be a true and accurate summary of all bids on the above Contract 81 received this day by the Metr. Dist. Water Supply Commission.

★ *Contract Awarded April 18, 1939.*
Contract Executed April 26, 1939.

R Nelson Molt.
R. Nelson Molt, Secretary

COMMONWEALTH OF MASSACHUSETTS
METR DISTR WATER SUPPLY COMM

CONTRACT 82

FOR
CONSTRUCTING QUABBIN HILL ROAD
IN THE TOWN OF WARE, MASSACHUSETTS
PWA DOCKET NO. MASS.1551F = MASS STATE PROJECT NO.0-208
ITEM B

CANVASS OF BIDS FOR CONTRACT 82 — OPENED FEB. 16, 1939

				★ ① G. Rotondi & Son 199 Laurel St Melrose, Mass		② Coleman Bros Corp 245 State St Boston, Mass		③ C & R Construction Company 18 Bradeen St Roslindale, Mass.		④ A G Tomasello & Son, Inc 30 Clayton St Dorchester, Mass.		⑤ Kelleher Corporation Turners Falls, Mass	
Item No's	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1 (1)	Roadway Earth Excavation	79 500	Cu. Yd	$ .30	$23850	$ 44	$34980	$ 30	$23850	$ 54	$42330	$ .26	$20670.
2 (3)	Ledge Excavation	16 000	Cu. Yd.	1.25	20000	44	7040	1 25	20000	.54	8640	1 35	21600
3 (4)	Ordinary Borrow	35 900	Cu Yd	.30	10770	.25	8975.	.30	10770	30	10770	26	9334
4 (5)	Plain Cement Concrete Masonry, Class C	820	Cu Yd	14	11480	15	12300	15	12,300	17 50	14350	15.	12300
5 (6)	Reinforced Cement Concrete Masonry, Class B	65	Cu Yd	20	1300	20	1300	70	4,550	25	1625	35	2275
6 (8)	Crushed Stone	21 500	Ton	2	43000	2.	43000	2	43,000	2 10	45150	2 25	48375
7 (9)	Bituminous Material	156 600	Gal.	.095	14877	10	15660	105	16443	105	16443	09	14094
8 (10)	10" Vitrified Clay Pipe	900	Lin Ft	.50	450	40	360	60	540	64	576	55	495
9 (11)	12" " " "	60	Lin Ft	70	42	60	36	70	42	73	43.80	65	39
10 (12)	12" Reinforced Concrete Pipe	2 900	Lin. Ft	1 20	3480	1 20	3480.	1.05	3045	1.12	3248.	1 15	3335
11 (13)	18" " " "	850	Lin Ft	2	1700	2	1700	1.70	1445	1 85	1572 50	2	1700
12 (14)	24" " " "	650	Lin. Ft	3	1950	3	1950	2.55	1657 50	2 85	1852.50	3.	1950
13 (15)	30" " " "	100	Lin Ft	4.50	450	4 25	425	3.60	360	3 90	390.	4 50	450
14 (17)	Stone Filling	500	Cu Yd.	1.	500	1.50	750	1	500	1	500	1.50	750
15 (19)	Catch Basins, Type A	10	Each	65.	650	60	600	60	600	75	750	75.	750
16 (26)	Riprap	275	Cu. Yd.	2.	550	3	825	2.	550	1 75	481.25	3	825
17 (27)	6" Side Drain	5 000	Lin. Ft.	1	5000	1	5000	1.25	6250	1 25	6250	1.25	6250
18 (28)	10" " "	300	Lin. Ft.	1 30	450	1 50	450	1.50	450	1 65	495	1 80	540
19 (30)	Gravel Borrow	27 300	Cu Yd	.30	8190	40	10920.	.35	9555	38	10374	.50	13650
20 (31)	Sand Borrow	1 560	Cu Yd.	1	1560	1 50	2340	2	3120	1.	1560	1.50	2340
21 (32)	Stripping Gravel Pits	7 000	Cu Yd	.10	700	20	1400	.10	700.	.05	350	10	700
22 (35)	Gravel Surfacing	700	Cu Yd	.70	490	1	700.	1.	700	.50	350	1.25	875
23 (41)	Manholes	2	Each	65.	130	60	120	55.	110	75	150.	75.	150
24 (46)	Fine Grading, Rolling and Finishing	164 500	Sq Yd.	.02	3290	02	3290	02	3290	.025	4112 50	03	4935
25 (48)	Reinforcement for Cem. Concrete Structures	5 000	Pound	.06	300	.05	250	.04	200	05	250	.06	300
26 (50)	Dry Stone Masonry	50	Cu. Yd	6	300	10	500	8	400	6	300	8	400
27 (51)	Corrugated Pipe Removed and Relaid	50	Lin Ft.	1.	50	1	50.	2.	100	1	50	.50	25
28 (60)	Cobble Stone Gutters	910	Sq Yd.	1	910	1	910	1	910	1	910	1 25	1137.50
29 (69)	Highway Guard	15 400	Lin Ft.	.90	13860	90	13860	.90	13 860	1	15400	1	15400
30 (70)	Trench Excavation	8 000	Cu Yd	.90	7200	1	8000.	.80	6400	50	4000	1.25	10000
31 (72)	Clearing and Grubbing	34	Acre	200	6800	100	3400	100	3400	75	2550	150	5100
32 (74)	Loam Borrow	14 100	Cu Yd.	.60	8460	.90	12690	80	11 280	.55	7755	90	12690.
33 (77)	Catch Basins, Type B	5	Each	50	250	50	250	40	200	60.	300	50	250
34 (78)	36" Reinforced Concrete Pipe	160	Lin. Ft	6 50	1040	5.50	880	5.	800	5	800	6	960
35 (79)	42" " " "	36	Lin Ft	8	288	8	288	7.	252.	6.40	230 40	10	360
36 (80)	12" Bituminous Coated Corrugated Metal Pipe	120	Lin Ft	1.50	180	1.50	180	1 30	156	1.30	156	1 40	168
37 (82)	12" Heavy Cast Iron Water Pipe	48	Lin Ft	2 50	120	2	96	3	144	2	96	3	144
38 (83)	Seeding and Grassing	15	Acre	100	1500	200	3000	260	3 900	100	1500	150	2250
39 (84)	Highway Guard End Anchors	60	Each	30	1800	32	1920	30	1800	38	2280	40	2400
40 (85)	Highway Guard Intermediate Anchors	38	Each	30.	1140	35	1330	30.	1140	36.50	1387	35.	1330
41 (86)	Stone Paving	200	Cu Yd	3.	600	4	800	3	600	3 50	700	4.	800
42 (87)	Dummy Posts	120	Each	1.50	180	3	360	2 50	300	3.	360	3	360.
43 (88)	Macadam Berms	3 500	Lin. Ft	.20	700	.25	875	20	700	05	175	.25	875
44 (89)	Loam Berms	1 300	Lin Ft	.15	195	20	260	30	390	05	65	25	325
45 (90)	Cleaning Borrow Pits	3	Acre	50.	150	25	75	100	300	50	150	50	150
46 (91)	Scarifying and Reshaping	1 330	Sq Yd.	.10	135	20	270	05	67.30	10	135	.10	135
47 (93)	48" Reinforced Concrete Pipe	60	Lin. Ft.	10.	600	10	600	8	480	8 20	492	12	720
48 (94)	Screened Gravel	100	Cu Yd	2	200	2.	200	2.50	250	2 75	275	2 80	280
49 (99)	Trench Ledge Excavation	1 300	Cu Yd	4	5200	5	6500	3	3900	2 50	3250	3.	3 900
50 (100)	Boulder Guard Rail	1200	Lin. Ft.	.50	600	.50	600	80	960	45	540	.70	840
51 (101)	Cemented Stone Masonry	100	Cu. Yd.	9	900	15.	1300	10	1000	9	900	12	1200
52 (102)	6" Vitrified Clay Pipe	300	Lin. Ft	.35	105	50	150	50	150	25	75	40	120
53 (103)	10" Bituminous Coated Corrugated Metal Pipe	200	Lin. Ft	1 35	270	1.50	300	1.	200	1.20	240	1 25	250
	Sub-Total, (Items 1 to 53 Inclusive)				216,892		217,495.		218,067.		218,284 35		231,251.50
54 (104)	Furnishing Performance Bond - Rate Per $1000			10	2168.92	10.	2174 95	10.	2180 67	10.	2182.85	10.	2312.52
	Totals				$219,060.92		$219,669.95		$220,247 67		$220,467.80		$233,564.02
	Bid Bond Deposit				$10250		$10250		$10,250	(Cert Check)	$10,250.	(Cert Check)	$10,250

				⑥ Arute Bros, Inc 560 S Main St., New Britain Conn		⑦ Daniel O'Connell's Sons, Inc Holyoke Mass		⑧ Carlo Bianchi & Company, Inc 24 Union Ave Framingham Mass		⑨ The Lane Construction Corporation Meriden, Conn		⑩ M F Gaddis, Inc., 6 Beacon St., Boston, Mass.	
Item No's	Description	Quantity	Unit	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1 (1)	Roadway Earth Excavation	79 500	Cu. Yd	$ 60	$47700	$ .38	$30210	$ .35	$27825	$ 60	$47,700	$ 1	$79500
2 (3)	Ledge Excavation	16 000	Cu. Yd.	60	9600	1 74	27840	2	32000	60	9600	3 50	56000
3 (4)	Ordinary Borrow	35 900	Cu Yd	30	10770	33	11,847	35	12565	.15	5385	.85	30515
4 (5)	Plain Cement Concrete Masonry, Class C	820	Cu Yd	16	13120	14 80	12,136	20	16400	17	13940	22	18040
5 (6)	Reinforced Cement Concrete Masonry, Class B	65	Cu Yd	20	1300.	34 40	2,236	25.	1625	50	3250	35	2275
6 (8)	Crushed Stone	21 500	Ton	2.20	47300	2.06	44290	2 25	48375	2 25	48375	2 40	51600
7 (9)	Bituminous Material	156 600	Gal.	09	14094	.102	15973.20	.095	14877	10	15660	105	16443
8 (10)	10" Vitrified Clay Pipe	900	Lin Ft	60	540	61	549	.60	540	50	450	65	585
9 (11)	12" " " "	60	Lin Ft	70	42	74	44 40	1	60	75	45	.82	49 20
10 (12)	12" Reinforced Concrete Pipe	2 900	Lin. Ft	1 10	3190.	1.19	3451	1 15	3335	1 20	3480.	1.25	3625
11 (13)	18" " " "	850	Lin Ft	1 75	1487.50	2 00	1700	2 25	1912 50	1 90	1615	2 20	1870
12 (14)	24" " " "	650	Lin. Ft	3	1950	3 12	2028	3 75	2437 50	2 80	1820	3 25	2112 50
13 (15)	30" " " "	100	Lin Ft	4	400	4.58	458	5 50	550.	5	500.	4 40	440
14 (17)	Stone Filling	500	Cu Yd.	1 50	750	2 58	1290	2.50	1250	3	1500	2 50	1250
15 (19)	Catch Basins, Type A	10	Each	60	600	79 80	798	75	750	100	1000	75.	750
16 (26)	Riprap	275	Cu. Yd.	2 50	687.50	1.35	371.25	3 50	962 50	4	1100	5 50	1512 50
17 (27)	6" Side Drain	5 000	Lin. Ft.	1 50	7500	1 26	6300	1 25	6250	1 50	7500	1.75	8750
18 (28)	10" " "	300	Lin. Ft.	2	600	1 96	588	1 75	525	1 75	525	2 85	855.
19 (30)	Gravel Borrow	27 300	Cu Yd	.50	13650	.56	15288	60	16380	70	19110	85	23205
20 (31)	Sand Borrow	1 560	Cu Yd.	1	1560.	1.31	2043 60	1	1560	1.50	2340	1	1560
21 (32)	Stripping Gravel Pits	7 000	Cu Yd	15	1050	.22	1540.	20	1400	05	350	20	1400
22 (35)	Gravel Surfacing	700	Cu Yd	75	525	81	567	1	700	2	1400	1 50	1050
23 (41)	Manholes	2	Each	60.	120	80 75	161.50	75	150	125	250.	75	150
24 (46)	Fine Grading, Rolling and Finishing	164 500	Sq Yd.	03	4935	.069	11350.50	03	4935	.05	8225	05	8225
25 (48)	Reinforcement for Cem. Concrete Structures	5 000	Pound	.06	300.	.054	270	06	300	06	300.	06	300
26 (50)	Dry Stone Masonry	50	Cu. Yd	10	500	10.75	537 50	10.	500	10	500.	10	500
27 (51)	Corrugated Pipe Removed and Relaid	50	Lin Ft.	1.	50	.54	27	1	50	.50	25	1.	50
28 (60)	Cobble Stone Gutters	910	Sq Yd.	1.	910	1 53	1392.30	1.50	1365	2.50	2275	1.	910
29 (69)	Highway Guard	15 400	Lin Ft.	1.	15400	90	13860	1	15400	1 10	16940	.92	14168
30 (70)	Trench Excavation	8 000	Cu Yd	1	8000	1.31	10480.	1 15	9200	1 25	10000	1.25	10000
31 (72)	Clearing and Grubbing	34	Acre	80	2720	140	4760.	125.	4250	100	3400.	200	6800.
32 (74)	Loam Borrow	14 100	Cu Yd.	90	12690	1.11	15551	1	14100	1	14100	90	12690
33 (77)	Catch Basins, Type B	5	Each	50	250	53 80	269	70	350	65	325	50	250
34 (78)	36" Reinforced Concrete Pipe	160	Lin. Ft	5	800	5 92	947.20	7.50	1200	6	960	5 25	840.
35 (79)	42" " " "	36	Lin Ft	7	252	7 69	276 84	10.	360	9	324	7	252.
36 (80)	12" Bituminous Coated Corrugated Metal Pipe	120	Lin Ft	1 50	180	1.50	180	1.50	180	1 40	168	1 55	186
37 (82)	12" Heavy Cast Iron Water Pipe	48	Lin Ft	3	144	2.10	100.80	3	144	1 60	76 80	3	144
38 (83)	Seeding and Grassing	15	Acre	200	3000	91.50	1372.50	250	3750	200	3000	300	4500.
39 (84)	Highway Guard End Anchors	60	Each	40	2400	37 65	2259.	35	2100.	50	3000	39	2340.
40 (85)	Highway Guard Intermediate Anchors	38	Each	40.	1520	35.50	1349.	35.	1330	50	1900	48	1824
41 (86)	Stone Paving	200	Cu Yd	2 50	500	3 76	752	4	800.	5	1000	7.	1400
42 (87)	Dummy Posts	120	Each	2	240	2 96	355.20	3	360	3	360	6	720.
43 (88)	Macadam Berms	3 500	Lin. Ft	25	875	12	420	.50	1750	.30	1050	25	875.
44 (89)	Loam Berms	1 300	Lin Ft	.25	325	03	39	.25	325	15	195	.25	325
45 (90)	Cleaning Borrow Pits	3	Acre	50.	150.	104	312	100	300	200	600	50	150
46 (91)	Scarifying and Reshaping	1 330	Sq Yd.	.05	67 50	.075	101.25	.20	270	10	135	.20	270
47 (93)	48" Reinforced Concrete Pipe	60	Lin. Ft.	9.	540	9 15	549	11.50	690	15	900	9.25	555
48 (94)	Screened Gravel	100	Cu Yd	2.	200	2 42	242	2.	200	5	500	3	300
49 (99)	Trench Ledge Excavation	1 300	Cu Yd	3	3 900	5 34	6942	4	5200	4	5200	8.	10400
50 (100)	Boulder Guard Rail	1200	Lin. Ft.	.50	600	.43	516	.70	840	.75	900	.55	660
51 (101)	Cemented Stone Masonry	100	Cu. Yd.	10	1000	17 20	1720	18.	1800	12	1200	14	1400
52 (102)	6" Vitrified Clay Pipe	300	Lin. Ft	40	120	38	114	.50	150	.50	150	.38	114.
53 (103)	10" Bituminous Coated Corrugated Metal Pipe	200	Lin. Ft	1.35	270	1.40	280.	1 30	260	1 50	300	1.30	260
	Sub-Total, (Items 1 to 53 Inclusive)				241,374.50		259 135 04		264888.50		264,903 80		384,345.20
54 (104)	Furnishing Performance Bond - Rate Per $1000			10.	2413.75	10.	2591 35	10.	2648 89	10	2649.04	10	3849 45
	Totals				$243,788.25		$261,726 39		$267,537 39		$267,552 84		$388,794 65
	Bid Bond Deposit			(Cert Check)	$10250		$10250		$10,250	(Cert Check)	$10,250.		$10,250.

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 82 received this day by the Metr Distr. Water Supply Commission

R Nelson Molt
R. Nelson Molt, Secretary

★ Contract awarded 3-9-39
Contract executed 3-9-39

CANVASS OF BIDS FOR CONTRACT 83 - OPEN AUGUST 3, 1939

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
CONTRACT 83
FOR CONSTRUCTING THE SPOT POND BY-PASS IN THE TOWN OF STONEHAM AND THE CITY OF MEDFORD MASSACHUSETTS.
PWA. DOCKET NO. MASS. 1551-F MASS. STATE PROJECT NO D-208

		ALTERNATES*					
		Ⓐ		Ⓑ		Ⓒ	
Item	Description	Unit	Quantity	Unit	Quantity	Unit	Quantity
1	Clearing and Grubbing	Acre	2	Acre	2	Acre	2
2	Stripping	Cu. Yd	1,000	Cu. Yd.	1,000	Cu. Yd.	1,000
3	Earth excavation and refill.	Cu. Yd	11,000	Cu. Yd	10,800	Cu. Yd.	10,800
4	Rock excavation, blasting permitted.	Cu. Yd	4,800	Cu. Yd	4,500	Cu. Yd.	4,500
5	Rock excavation, blasting not permitted.	Cu. Yd	210	Cu. Yd	200	Cu. Yd.	200
6	Borrow.	Cu. Yd	2,000	Cu. Yd	3,000	Cu. Yd.	3,100
7	Soil Dressing	Cu. Yd	2,000	Cu. Yd.	2,000	Cu. Yd.	2,000
8	Seeding and dressing.	Acre	2.5	Acre	2.5	Acre	2.5
9	Furnishing and laying Type* Pipe	Lin. Ft	4,374	Ton	581	Ton	569
10	Furnishing & laying misc. C.I. pipe & specials	Pound.	160,000	Pound.	160,000	Pound	160,000
11	Reinforced concrete	Cu. Yd.	400	Cu. Yd.	400	Cu. Yd.	400
12	Miscellaneous concrete.	Cu. Yd.	500	Cu. Yd	500	Cu. Yd.	500
13	Waterproofing	Sq. Yd.	350	Sq. Yd.	350	Sq. Yd.	350
14	Portland cement	Barrel.	1,350	Barrel	1,350	Barrel	1,350
15	Reinforcing steel.	Pound.	55,000	Pound	55,000	Pound	55,000
16	Miscellaneous iron and steel.	Pound	18,000	Pound	18,000	Pound	18,000
17	Miscellaneous non-ferrous metals	Pound	300	Pound	300	Pound	300
18	Coring for & setting metal work Furn by Comm	Pound	164,000	Pound	164,000	Pound	164,000
19	Crushed stone and screened gravel.	Cu. Yd.	500	Cu. Yd.	500	Cu. Yd.	500
20	Paving	Cu. Yd.	100	Cu. Yd	100	Cu. Yd.	100
21	Cobble gutters	Cu. Yd.	20	Cu. Yd	20	Cu. Yd.	20
22	Tile pipe 8" in diameter.	Lin. Ft.	200	Lin. Ft.	200	Lin. Ft.	200
23	Permanent fencing	Lin. Ft.	3,600	Lin. Ft.	3,600	Lin. Ft.	3,600
24	Miscellaneous lumber.	M Ft B.M.	25	M Ft B.M.	25	M Ft B.M.	25
25	Valve Chambers	Ft. of Depth	60	Ft. of Depth	60	Ft. of Depth	60
26	Blow-off valve chambers.	Ft of Depth	30	Ft. of Depth	30	Ft. of Depth	30
27	Connection at south end.	Lump Sum	—	Lump Sum	—	Lump Sum	—
28	Connections at east end.	Lump Sum	—	Lump Sum	—	Lump Sum	—
29	Electrical work.	Lump Sum	—	Lump Sum	—	Lump Sum	—
30	Cleaning up.	Lump Sum	—	Lump Sum	—	Lump Sum	—
31	Restoration of grounds.	Lump Sum		Lump Sum		Lump Sum	
	Sub total (Items 1 to 31 inclusive)						
32	Furnishing performance bond, rate per $1000.00						

Item	★ ① S. Rotondi & Sons, 140 Franklin St., Stoneham, Mass. Ⓐ		② M. De Matteo Const. Co., 55 Stella Rd., Roslindale, Mass. Ⓒ		③ C&C. Construction Co., 18-28 Eden St., Chelsea, Mass. Ⓒ	
	Price	Amount	Price	Amount	Price	Amount
1	$99.00	$198.00	$150.00	$300.00	$150.00	$300.00
2	.40	400.00	.30	300.00	1.00	1,000.00
3	1.12½	12,375.00	1.10	11,880.00	1.65	17,820.00
4	2.00	9,600.00	2.75	12,375.00	1.65	7,425.00
5	6.99	1,467.90	6.00	1,200.00	1.65	330.00
6	.33	660.00	.25	775.00	.25	775.00
7	.40	800.00	1.00	2,000.00	.60	1,200.00
8	177.00	442.50	210.00	525.00	100.00	250.00
9	15.99	69,940.26	129.52	73,696.88	126.00	71,694.00
10	.065	10,400.00	.073	11,680.00	.10	16,000.00
11	14.90	5,960.00	12.50	5,000.00	12.00	4,800.00
12	12.00	6,000.00	9.65	4,825.00	6.00	3,000.00
13	1.00	350.00	.75	262.50	1.00	350.00
14	2.57	3,469.50	2.70	3,645.00	2.75	3,712.50
15	.035	1,925.00	.034	1,897.50	.045	2,475.00
16	.06	1,080.00	.12	2,160.00	.12	2,160.00
17	.59	177.00	.50	150.00	.50	150.00
18	.02	3,280.00	.012	1,968.00	.01¼	2,050.00
19	2.30	1,150.00	1.75	875.00	1.25	625.00
20	3.33	333.00	3.00	300.00	5.00	500.00
21	4.88	97.60	3.00	60.00	7.00	140.00
22	.99	198.00	.50	100.00	.50	100.00
23	1.08	3,888.00	1.05	3,780.00	1.10	3,960.00
24	44.44	1,111.00	50.00	1,250.00	30.00	750.00
25	10.00	600.00	8.50	510.00	12.00	720.00
26	10.00	300.00	7.50	225.00	12.00	360.00
27	999.50	999.50	650.00	650.00	1,000.00	1,000.00
28	2,499.00	2,499.00	1,160.00	1,160.00	3,150.00	3,150.00
29	1,000.00	1,000.00	900.00	900.00	460.00	460.00
30	400.00	400.00	1,000.00	1,000.00	750.00	750.00
31	700.00	700.00	2000.00	2,000.00	500.00	500.00
Sub total		141,801.26		147,449.88		148,506.50
32	15.00	2,127.02	15.00	2,211.75	15.00	2,227.60
		$143,928.28		$149,661.63		$150,734.10
	Bid Bond	$8000.00	Bid Bond	$8,000.00	Bid Bond	$8000.00

Item	④ C&R. Construction Co., 75 Bradeen St., Roslindale, Mass Ⓐ		⑤ Joseph P. McCabe Inc., 509 E First St., South Boston, Mass Ⓐ		⑥ Martinucci Bros. & Co., 51 Ceylon St., Dorchester, Mass. Ⓐ	
	Price	Amount	Price	Amount	Price	Amount
1	$200.00	$400.00	$150.00	$300.00	$200.00	$400.00
2	.30	300.00	.35	350.00	.50	500.00
3	1.00	11,000.00	2.65	29,150.00	.50	5,500.00
4	1.00	4,800.00	3.50	16,800.00	2.50	12,000.00
5	10.00	2,100.00	5.00	1,050.00	10.00	2,100.00
6	.35	700.00	.25	500.00	.30	600.00
7	.80	1,600.00	.75	1,500.00	.65	1,300.00
8	250.00	625.00	150.00	375.00	250.00	625.00
9	16.00	69,984.00	14.00	61,236.00	19.45	85,074.30
10	.10	16,000.00	.10	16,000.00	.07	11,200.00
11	15.00	6,000.00	9.50	3,800.00	17.00	6,800.00
12	10.00	5,000.00	8.00	4,000.00	10.00	5,000.00
13	2.00	700.00	.25	87.50	.90	315.00
14	2.60	3,510.00	2.50	3,375.00	2.50	3,375.00
15	.04	2,200.00	.035	1,925.00	.07	3,850.00
16	.15	2,700.00	.10	1,800.00	.10	1,800.00
17	.50	150.00	.25	75.00	.25	75.00
18	.03	4,920.00	.01	1,640.00	.02	3,280.00
19	2.00	1,000.00	1.50	750.00	1.50	750.00
20	5.00	500.00	2.50	250.00	5.00	500.00
21	4.00	80.00	3.50	70.00	5.00	100.00
22	1.00	200.00	.60	120.00	.50	100.00
23	1.00	3,600.00	1.00	3,600.00	1.00	3,600.00
24	80.00	2,000.00	10.00	250.00	50.00	1,250.00
25	25.00	1,500.00	15.00	900.00	10.00	600.00
26	9.00	270.00	15.00	450.00	10.00	300.00
27	1,750.00	1,750.00	500.00	500.00	1,000.00	1,000.00
28	2,000.00	2,000.00	500.00	500.00	1,500.00	1,500.00
29	300.00	300.00	850.00	850.00	500.00	500.00
30	1,000.00	1,000.00	150.00	150.00	1,000.00	1,000.00
31	3,000.00	3,000.00	500.00	500.00	1,000.00	1,000.00
Sub total		149,889.00		152,853.50		155,994.30
32	15.00	2,248.34	15.00	2,292.80	15.00	2339.91
		$152,137.34		$155,146.30		$158,334.21
	Bid Bond	$8000.00	Bid Bond	$8000.00	Bid Bond	$8000.00

Item	⑦ J.F. Fitzgerald Const. Co., 214 Essex St., Boston, Mass Ⓒ		⑧ Intercounty Const. Corp., Sylvan Place, Rye, New York Ⓐ		⑨ Leo Butler Co, 8416 Georgia Ave., Silver Spring, Maryland Ⓐ	
	Price	Amount	Price	Amount	Price	Amount
1	$100.00	$200.00	$120.00	$240.00	$227.50	$455.00
2	.75	750.00	.36	360.00	.59	590.00
3	.85	9,180.00	.90	9,900.00	.60	6,600.00
4	3.50	15,750.00	1.25	6,000.00	3.90	18,720.00
5	10.00	2,000.00	14.00	2,940.00	13.00	2,730.00
6	.70	2,170.00	.72	1,440.00	.78	1,560.00
7	1.64	3,280.00	.60	1,200.00	1.30	2,600.00
8	350.00	875.00	120.00	300.00	181.00	452.50
9	116.00	66,004.00	19.10	83,543.40	19.30	84,418.20
10	.10	16,000.00	.09	14,400.00	.09	14,400.00
11	20.00	8,000.00	20.40	8,160.00	22.10	8,840.00
12	15.00	7,500.00	8.40	4,200.00	7.80	3,900.00
13	.30	105.00	.36	126.00	.20	70.00
14	2.60	3,510.00	3.00	4,050.00	3.19	4,306.50
15	.05	2,750.00	.06	3,300.00	.05	2,750.00
16	.15	2,700.00	.22	3,960.00	.13	2,340.00
17	1.00	300.00	.60	180.00	.52	156.00
18	.03	4,920.00	.018	2,952.00	.026	4,264.00
19	2.00	1,000.00	2.64	1,320.00	2.60	1,300.00
20	4.00	400.00	18.00	1,800.00	6.50	650.00
21	6.00	120.00	18.00	360.00	7.80	156.00
22	.30	60.00	.44	88.00	.65	130.00
23	.94	3,384.00	1.20	4,320.00	1.24	4,464.00
24	125.00	3,125.00	48.00	1,200.00	49.40	1,235.00
25	14.00	840.00	15.90	954.00	9.10	546.00
26	8.00	240.00	13.00	390.00	7.80	234.00
27	500.00	500.00	540.00	540.00	390.00	390.00
28	500.00	500.00	2,150.00	2,150.00	2,015.00	2,015.00
29	500.00	500.00	1,170.00	1,170.00	1,300.00	1,300.00
30	400.00	400.00	390.00	390.00	650.00	650.00
31	500.00	500.00	588.00	588.00	1,300.00	1,300.00
Sub total		157,563.00		162,521.40		173,522.20
32	15.00	2,363.45	15.00	2,437.82	15.00	2,602.83
		$159,926.45		$164,959.22		$176,125.03
	Bid Bond	$8000.00	Bid Bond	$8,000.00	Cert. Check	$8000.00

Item	⑩ Coleman Bros. Corp., 245 State St., Boston, Mass Ⓐ		⑪ National Engineering & Contracting Co., 66 Park St., Dorchester, Mass. Ⓒ		⑫ A. Baruffaldi Co., 52 Powder House Blvd., West Somerville, Mass Ⓒ	
	Price	Amount	Price	Amount	Price	Amount
1	$200.00	$400.00	$150.00	$300.00	$200.00	$400.00
2	.50	500.00	1.00	1,000.00	.50	500.00
3	1.00	11,000.00	1.63	17,604.00	2.50	27,000.00
4	5.00	24,000.00	2.50	11,250.00	2.50	11,250.00
5	20.00	4,200.00	15.00	3,000.00	20.00	4,000.00
6	1.00	2,000.00	.70	2,170.00	1.00	3,100.00
7	1.00	2,000.00	.75	1,500.00	1.50	3,000.00
8	200.00	500.00	200.00	500.00	500.00	1,250.00
9	19.00	83,106.00	140.00	79,660.00	140.00	79,660.00
10	.085	13,600.00	.125	20,000.00	.11	17,600.00
11	15.00	6,000.00	12.00	4,800.00	15.00	6,000.00
12	9.00	4,500.00	11.00	5,500.00	10.00	5,000.00
13	.50	175.00	1.00	350.00	2.00	700.00
14	2.50	3,375.00	2.80	3,780.00	3.00	4,050.00
15	.035	1,925.00	.05	2,750.00	.05	2,750.00
16	.10	1,800.00	.105	1,890.00	.10	1,800.00
17	.50	150.00	.75	225.00	.30	90.00
18	.03	4,920.00	.05	8,200.00	.04	6,560.00
19	3.00	1,500.00	2.00	1,000.00	2.00	1,000.00
20	5.00	500.00	5.00	500.00	5.00	500.00
21	4.00	80.00	5.00	100.00	10.00	200.00
22	.75	150.00	.75	150.00	1.00	200.00
23	1.00	3,600.00	1.00	3,600.00	1.10	3,960.00
24	80.00	2,000.00	70.00	1,750.00	80.00	2,000.00
25	12.00	720.00	10.00	600.00	20.00	1,200.00
26	8.00	240.00	10.00	300.00	15.00	450.00
27	350.00	350.00	1,500.00	1,500.00	4,000.00	4,000.00
28	2,000.00	2,000.00	5,500.00	5,500.00	4,000.00	4,000.00
29	500.00	500.00	500.00	500.00	500.00	500.00
30	250.00	250.00	1,000.00	1,000.00	1,000.00	1,000.00
31	250.00	250.00	1,000.00	1,000.00	1,000.00	1,000.00
Sub total		176,291.00		181,979.00		194,720.00
32	15.00	2,644.36	15.00	2,729.68	15.00	1,920.80
		$178,935.36		$184,708.68		$196,640.80
	Bid Bond	$8000.00	Cert. Check	$8000.00	Bid Bond	$8000.00

★ Contract Awarded August 10, 1939.
Contract Executed August 29, 1939.

* Alternates:
A. Precast Steel-Cylinder Reinforced Concrete Pressure Pipe, "Type A"
B. Steel-Plate Pipe Mortar-Lined, "Type B"
C. Steel-Plate Pipe Spun Bituminous Enamel-Lined, "Type C"
No bid received on Alternate B.

I certify the foregoing to be a true and accurate summary of all bids on the above Contract 83, received this day by the Metr. Dist. Water Supply Commission

R. Nelson Molt
R. Nelson Molt, Secretary

COMMONWEALTH OF MASSACHUSETTS
METR DISTR WATER SUPPLY COMMISSION

CONTRACT 85

FOR FURNISHING AND DELIVERING PRECAST STEEL-CYLINDER REINFORCED CONCRETE PRESSURE PIPE IN THE TOWNS OF SOUTHBOROUGH, FRAMINGHAM, WAYLAND, NATICK, AND WESTON, MASSACHUSETTS
P.W.A DOCKET NO. MASS. 1551-F
MASS. STATE PROJECT NO. D-208

CANVASS OF BIDS FOR CONTRACT 85

OPENED DECEMBER 19, 1938

ITEM	DESCRIPTION	UNIT	QUANTITY	★ ① Lock Joint Pipe Co. P.O. Box 21 Ampere N. J.		② American Concrete and Steel Pipe Co PO Box 1428 Arcade Sta Los Angeles, Calif		③ Price Brothers Co. 1932 E Monument Ave., Dayton, Ohio		④ Raymond Concrete Pile Co 140 Cedar St., New York N. Y.	
				PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	*Precast Concrete Pipe 12'6" in diam for 100-ft. head*	*Linear Foot*	10,000	$51.50	$515,000.00	$55.33	$553,300.00	$56.90	$569,000.00	$67.60	$676,000 00
2	" " " 11'6" " " " 100-ft. "	" "	38,000	44 05	1,673,900. –	45 10	1,713,800. –	45.40	1,725,200 –	47.20	1,793,600 –
3	" " " 11'6" " " " 110-ft. "	" "	9,000	45.55	409,950. –	47.13	424,170. –	48.55	436,950. –	48.85	439,650 –
4	" " " 11'6" " " " 120-ft. "	" "	6,000	47 20	283,200. –	49.27	295,620. –	50.47	302,820. –	50.35	302,100. –
5	" " " 11'6" " " " 130-ft. "	" "	1,500	48 55	72,825 –	51.12	76,680. –	52.41	78,615. –	52 00	78,000 –
6	*Precast Concrete Pipe 11'6" in diam for 140-ft. head*	*Linear Foot*	2,000	50 25	100,500. –	52 91	105,820. –	54 50	109,000. –	53.50	107,000. –
7	" " " 11'6" " " " 150-ft. "	" "	2,000	51.90	103,800. –	54.52	109,040. –	56 43	112,860. –	55.00	110,000. –
8	" " " 11'6" " " " 160-ft. "	" "	3,000	53.55	160,650. –	56.15	168,450. –	58.49	175,470. –	56 70	170,100. –
9	" " " 11'6" " " " 170-ft. "	" "	750	55.20	41,400. –	57 98	43,485. –	60.50	45,375. –	58 00	43,500. –
10	" " " 11'6" " " " 180-ft. "	" "	750	56.75	42,562.50	59.14	44,355. –	62.64	46,980. –	59.70	44,775. –
11	*Precast Concrete Pipe 11'6" in diam for 190-ft. head*	*Linear Foot*	500	58.45	29,225. –	61.19	30,595. –	64 27	32,135. –	61.35	30,675. –
12	" " " 11'6" " " " 200-ft. "	" "	500	60.95	30,475. –	63.66	31,830 –	67.70	33,850. –	64 00	32,000. –
13	" " " 11'6" " " " 210-ft. "	" "	1,000	62 75	62,750 –	66.00	66,000. –	69 63	69,630. –	65.75	65,750. –
14	" " " 11'6" " " " 220-ft. "	" "	1,000	64.35	64,350. –	68 28	68,280. –	71.91	71,910. –	67.50	67,500 –
15	" " " 7'0" " " " 100-ft. "	" "	144	21.50	3,096. –	21.05	3,031.20	22 20	3,196.80	24 25	3,492. –
16	*Precast Concrete Pipe 7'0" in diam. for 120-ft. head*	*Linear Foot*	144	22.75	3,276 –	22 36	3,219.84	23 73	3,417.12	25.40	3,657.60
17	" " " 7'0" " " " 140-ft. "	" "	108	24.00	2,592. –	23.80	2,570.40	25.24	2,725.92	26.80	2,894 40
18	" " " 7'0" " " " 150-ft. "	" "	84	24.50	2,058 –	24 47	2,055.48	26.17	2,198 28	27 60	2,318.40
19	" " " 7'0" " " " 160-ft. "	" "	84	25.00	2,100. –	25.18	2,115.12	26.83	2,253 72	28.25	2,373. –
20	" " " 7'0" " " " 170-ft. "	" "	84	25.75	2,163. –	25.93	2,178.12	27.62	2,320.08	28.90	2,427.60
21	*Precast Concrete Pipe 7'0" in diam for 180-ft. head*	*Linear Foot*	84	26.25	2,205. –	26.58	2,232.72	28.18	2,367.12	29.50	2,478 –
22	" " " 7'0" " " " 190-ft. "	" "	308	26.75	8,239 –	27.30	8,408 40	28 95	8,916.60	30.25	9,317. –
23	" " " 7'0" " " " 200-ft. "	" "	600	27.50	16,500. –	27.97	16,782. –	29.54	17,724 –	31 00	18,600. –
24	" " " 7'0" " " " 210-ft. "	" "	500	28.00	14,000. –	29.05	14,525 –	30.55	15,275. –	31.75	15,875. –
25	" " " 7'0" " " " 220-ft. "	" "	60	28.50	1,710. –	30.02	1,801.20	31.22	1,873.20	33.00	1,980. –
26	*Portland Cement*	*Barrel*	200,000	2.45	490,000. –	2 40	480,000. –	2.54	508,000 –	2.50	500,000. –
27	*Connections up to 8"*	*Each*	150	32.00	4,800. –	37.00	5,550. –	50.00	7,500. –	36.00	5,400. –
28	*Connections 9" to 16"*	*Each*	20	85.00	1,700. –	98.00	1,960. –	150.00	3,000. –	85.00	1,700. –
29	*Connections 17" to 24"*	*Each*	5	200 00	1,000. –	190.00	950. –	300.00	1,500. –	240.00	1,200. –
30	*Connections 25" to 36"*	*Each*	3	450.00	1,350. –	475.00	1,425. –	500.00	1,500. –	390.00	1,170. –
31	*Connections 37" to 48"*	*Each*	2	650.00	1,300 –	600.00	1,200. –	750.00	1,500. –	550.00	1,100. –
32	*Connections 49" to 60"*	*Each*	2	950.00	1,900. –	900.00	1,800. –	1,000.00	2,000. –	715.00	1,430. –
33	*Manholes*	*Each*	70	110.00	7,700. –	100.00	7,000. –	150.00	10,500. –	130.00	9,100. –
34	*Anchorage Connections*	*Each*	1,000	4.75	4,750. –	4 40	4,400. –	4.00	4,000. –	5.00	5,000. –
35	*Extra Joint Rings*	*Pound*	10,000	0.11	1,100. –	0.125	1,250. –	0.15	1,500. –	0 12	1,200. –
	TOTALS				$4,164,126 50		$4295,879.48		$4,413,062.84		$4,553,363 00
	Bid Bond Deposit				$230,000.00		$230,000.00		$230,000.00		$230,000.00

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No. 85, received this day by the METR. DISTR. WATER SUPPLY COMMISSION

R Nelson Mott.
R Nelson Mott, Secretary

★ *Contract awarded December 28, 1938*
Contract executed December 28, 1938

QUANTITIES INVOLVED IN CONTRACTS FOR LAYING THE PRESSURE AQUEDUCT SURFACE PIPE

Contract Number		75	77		78	79	81	
Aqueduct Section Number		1	3		4	5	6	
Diameter of Pipe	Unit	12'-6"	11'-6"	7'-0"	11'-6"	11'-6"	11-6"	7'-0"
Gross Length of Pressure Aqueduct	Lin.Ft.	9,665*	16,565**		17,800	18,000	15,270***	
Gross Length of Branch Lines	" "			120				2,305
Pipe Delivered to Nov. 30, 1939	Number of Pipes	731	990	6	892	1,127	773	183
	Lin.Ft.	8,772	15,840	72	14,272	18,032	12,368	2,196
Aqueduct Laid to Nov. 30, 1939	Number of Pipes	677	860	-	774	1,127	522	151
	Lin.Ft.	8,119	13,760	-	12,349	18,032	8,338	1,808
Total Work done and Materials Furnished to November 30, 1939, under Principal Items of Contracts								
Stripping	Cu.Yd.	18,100	31,000		30,000	34,500	35,500	
Earth Excavation	" "	160,000	156,200		150,200	170,800	112,800	
Rock Excavation	" "	10,500	9,130		2,940	4,350	17,400	
Refill and Embankment	" "	85,400	107,230		93,900	179,600	59,000	
Crushed Stone and Screened Gravel	" "	1,700	930		2,410	2,680	1,300	
Caring For and Laying 11'-6" Precast Concrete Pipe, Furnished by the Commission	Lin.Ft.	7,300	12,310		10,270	16,200	7,500	
Caring For and Laying 7'-0" Precast Concrete Pipe, Furnished by the Commission	" "	---	---		---	---	1,630	
Concrete Foundations and Anchorages for Pipe	Cu.Yd.	7,850	6,810		6,880	11,250	6,100	
Reinforced and Miscellaneous Concrete	" "	895	370		360	460	250	
Reinforcing Steel	Pound	101,000	80,000		54,380	104,700	46,800	
Portland Cement	Barrel	13,550	10,550		9,830	16,030	8,500	
Structural Steel	Pound	16,250	330		3,460	45,720	4,500	
Stone Masonry	Cu.Yd.	70	---		40	40	---	
Permanent Fencing, Type "B"	Lin.Ft.	5,500	5,800		---	---	---	

* Does not include 15 ft. of Surface Conduit in Contract 74 for Tunnel under Sudbury Reservoir
** " " " 19 ft. " " " " " " " " " " "
*** " " " 1306 ft. " Twin Conduit, etc., through Norumbega Reservoir in Contract 80, nor 40 ft. of Surface Conduit in Contract for Charles River Tunnel Shaft.

MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHEDS, 1939

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
WARE WATERSHED													
Ware River Intake Works*	1.94	3.15	3.21	3.62	2.19	2.96	1.35	3.70	2.10	4.56	0.91	3.37	33.06
West Rutland*	2.18	2.57	3.62	4.01	2.38	3.00	1.30	4.43	2.10	4.64	0.99	3.68	34.90
North Rutland	2.67	2.82	4.21	2.52	2.58	3.06	1.49	4.03	2.56	4.56	0.89	3.45	34.84
Williamsville	2.31	3.52	4.13	4.02	3.29	3.98	1.34	3.43	2.19	4.39	0.90	3.46	36.96
Hubbardston	2.31	3.16	3.45	3.85	2.96	4.29	1.29	3.00	1.71	4.75	0.95	3.16	34.88
1939 Mean	2.28	3.04	3.72	3.60	2.68	3.46	1.36	3.72	2.13	4.58	0.93	3.43	34.93
16-Year Mean	3.50	2.85	3.67	3.57	3.25	4.11	4.04	4.04	5.27	3.37	3.37	3.14	44.18
SWIFT WATERSHED													
West Ware	2.23	3.59	3.81	4.00	1.12	3.49	2.44	3.63	2.77	4.56	0.85	3.80	36.29
Enfield #*	2.74	3.44	2.79	5.02	1.25	3.23	2.90	3.81	2.83	5.19	1.02	4.15	38.37
Shutesbury	2.74	4.25	4.05	4.36	2.56	3.62	2.12	5.72	3.40	4.49	0.75	2.95	41.01
Wendell	2.96	3.83	4.32	4.74	1.78	3.78	2.27	3.05	2.69	5.00	1.10	3.58	39.10
Petersham**	3.18	5.15	4.49	4.70	2.06	2.72	0.97	2.66	2.01	4.58	0.99	4.20	37.71
Petersham*	-	-	-	-	-	-	1.21	3.75	2.18	4.46	1.01	3.69	-
Pelham*	-	-	-	-	-	-	4.44	7.03	2.64	5.22	1.00	4.16	-
1939 Mean***	2.77	4.05	3.89	4.57	1.75	3.37	2.14	3.78	2.74	4.76	0.94	3.74	38.50
20-Year Mean***	3.60	2.97	3.59	4.12	3.44	4.84	4.13	4.17	5.07	3.27	3.95	3.33	46.48

* Station maintained by Metropolitan District Water Supply Commission

**Station maintained by Metropolitan District Commission

Data for all other stations obtained through courtesy of Mass. State Department of Public Health

# Station moved to Administration Bldg., Winsor Dam, on July 1, 1939

*** Rainfall for M.D.W.S.C. stations at Petersham and Pelham not included in these figures as the stations were not in operation for the entire year

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The Commonwealth of Massachusetts

ANNUAL REPORTS
OF THE
METROPOLITAN DISTRICT WATER SUPPLY COMMISSION
FOR THE
Six Years Ending
November 30, 1940, 1941, 1942, 1943, 1944
and June 30, 1945

Publication of this Document Approved by the Commission on Administration and Finance
1M-11-47-19836

THE REPORTS OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled

which have been presented by the Commission for each of the six fiscal years ending November 30, 1940, 1941, 1942, 1943, 1944, and June 30, 1945, have for the purpose of publication in a single volume been abbreviated and combined herein, as its

FIFTEENTH, SIXTEENTH, SEVENTEENTH, EIGHTEENTH, NINETEENTH AND TWENTIETH ANNUAL REPORTS

Organization and Administration

Eugene C. Hultman continued as Chairman of the Commission until his death April 22, 1945. William T. Morrissey succeeded him June 13, 1945, by virtue of his appointment as Chairman of the Metropolitan District Commission. Thomas D. Lavelle and Edward J. Kelley continued as Associate Commissioners. Mr. Lavelle's term expired August 13, 1941, when he was succeeded by Charles H. Brown. R. Nelson Molt continued as Secretary. Karl R. Kennison continued as Chief Engineer, with other engineering personnel as described in his report, attached hereto.

The offices of the Commission were continued at 20 Somerset Street, Boston, together with the Headquarters Office of the Engineering Department. Field offices were continued at the Administration Building near Winsor Dam in Belchertown and at other locations indicated in the accompanying report of the Chief Engineer.

Under the provisions of the Chapter 720 of the Acts of 1941, the General Court delegated additional duties to the Commission authorizing new construction in the North and South Metropolitan Sewerage Systems; and, with respect to this sewerage work only, enlarged the Commission by the addition of two members, the Director and Chief Engineer of the Sewerage Division of the Metropolitan District Commission and the Director and Chief Sanitary Engineer of the Division of Sanitary Engineering of the Department of Public Health, both ex officio.

The Commission during the War emergency cooperated with the gasoline and rubber conservation program of the Commission on Administration and Finance and in 1942 took from the highways about one-half of the motor vehicles in use in 1941 and turned in thirty-one vehicles to the Commonwealth's general motor pool. Also in structures under the Commission's control, all oil-burning furnaces were converted to coal or wood. The Commission also collected and sold about twenty-six tons of scrap iron and 1900 pounds of scrap rubber and has contributed to the collection of war materials a considerable quantity of scrap in addition to such sales.

The Quabbin Supply

The extension of the sources of supply to the Ware and Swift rivers was continued under the provisions of Chapter 375 of the Acts of 1926 and Chapter 321 of the Acts of 1927. Following the commencement of storage in Quabbin Reservoir in 1939 as previously reported, the Commission has completed Winsor Dam and a scenic highway crossing Quabbin Hill between Winsor Dam and Quabbin Dike. The reservoir has filled somewhat more rapidly than estimated and on June 30, 1945, the water level had reached Elevation 519.92, only about

8 feet below the masonry spillway crest. At this level, over 341 billion gallons are held in storage available to the District, and over 34 of the total 39 square miles are flooded.

The Commission's watershed reforestation program has been curtailed by inability to secure sufficient labor and much of the surplus stock in its nurseries was disposed of.

Diversion of the waters of the Ware River to Quabbin and Wachusett reservoirs was continued and commencing September 17, 1941, water has been drawn from Quabbin Reservoir to Wachusett Reservoir as needed.

Commencing in April, 1941, the Commission permitted the use by the United States Army Air Corps at Westover Field, Chicopee, of various areas in the Quabbin reservation, it being advised by the Federal Government that this was the only available place in the East for practice bombing sites. It also permitted the Air Corps to construct a temporary boathouse for the storage of crash boats for the duration of the war emergency at the Reservoir and permission was granted for the construction of the same with the provision that all sanitary requirements directed by the Chief Engineer be carried out. The Commission also permitted the use by the United States Army as a gunnery range of a portion of this reservoir bottom and of the old Prison Camp property in North Rutland. The Air Corps, in 1942, carried out its agreement to fence off the north end of the Prescott Peninsula without expense to the Commonwealth, thus providing a major item of protection against trespassers and isolation of target areas. Commencing December 8, 1941, Winsor Dam, Quabbin Dike and other structures and approaches were put under constant guard and the public excluded for the duration. Commencing in 1942, a detail of the Metropolitan District Police has been stationed in the Administration Building at Winsor Dam.

The Commission continued and practically completed its reforestation program, and fire lanes were kept clear above the flow line of Quabbin Reservoir. Various areas of hurricane-felled pine and hardwood have been cleared to reduce the fire hazard. Some work was done in 1945 on the control of gypsy moth infestations on the so-called Prescott Peninsula. The three boats of the Commission, the Enfield, Greenwich and Dana, were in use on the Reservoir for the transportation of workmen of the labor force, for fire protection and other duties. The Air Force, in the late spring of 1943, added to its fleet of boats on the Reservoir a forty-two-foot fire boat completely equipped with pumps and forest fire-fighting equipment and maintained the same during the season of open water. In addition, detachments were furnished by the Air Forces during the dry periods for fire-fighting. At the Commission's request, the Air Force, in 1944, secured additional fire-fighting equipment for the protection of the target areas. This equipment includes dual-wheeled fire trucks, auxiliary pumpers, several thousand additional feet of hose and an amphibious jeep. This last piece of equipment is particularly adapted for fires on the numerous islands of the reservoir and makes accessible for fire fighting the whole shore line of the reservoir. In addition, during the season of fire hazard, the Air Force has stationed an observer in the tower on Quabbin Hill. In 1945, negotiations were instituted by the Commission with officials at Westover Field relative to claims for damages arising from fires on the watershed in the previous year due to bombing. These claims are still in process of settlement.

The Commission continued its force of local labor for the removal of bodies to Quabbin Park Cemetery and outside cemeteries. A total of 5,761 bodies were removed and this work was completed on October 4, 1944.

The Commission completed the two-way radio system centering in the fire lookout town on Quabbin Hill, which has made it possible to directly contact by air the Metropolitan District Commission's office building at 20 Somerset Street, Boston, as well as Sudbury and Wachusett dams and Shaft 8 of Quabbin Aqueduct. Mobile units installed in the work boat and patrol boat on Quabbin Reservoir and in six cruising cars, transferred to the Metropolitan Police, provide a system for constant communication covering the aqueducts and the Quabbin Reservoir area.

In 1943, the Commission requested the abandonment of about 17 miles of town and county roads within the area of the Ware River Watershed upon which there were no buildings remaining. These will be kept usable, however, to provide additional protection from forest fires.

Flood Protection

The Quabbin Aqueduct carried away the crest of two flood flows in 1944. In June, there was a heavy rainfall on the watershed reaching a maximum of 11.82 inches in Hubbardston in a 24-hour period, which created sudden high water. The Barre Wool Combing Company at the time had under construction a new dam and the prompt operation of the Intake at Shaft 8 removed the possibility of all damage. Lower down on the river in Ware, while there was high water, no damage was suffered by any manufacturing plant. The warning of the Weather Bureau gave ample time to prepare for the hurricane of September 14. The Aqueduct proved ample to carry the high flow. The property under the control of the Commission suffered no serious damage. The wind damage did not approach that of the 1938 storm and no extensive areas of woodland were affected, although the rainfall reached a maximum of 7.84 inches in a 24-hour period. For further details see the attached report of the Chief Engineer.

The Commission conferred on several occasions in 1943 relative to a flood control reservoir at Barre Falls, Massachusetts, approximately 6 miles above the intake of the Commission at Coldbrook, as provided by Chapter 724 of the 76th Congress of the United States, 3rd Session. The Commission also went to Springfield and conferred personally with the Honorable Charles R. Clason, Congressman, relative to the use of the Ware River by the Commission and the possible effect of a floor control reservoir above the Intake Works of the Commission at Shaft 8 of the Quabbin Aqueduct. The Commission also conferred with the engineers from the District Office of the United States Army Engineers, in Providence, Rhode Island, with a view to protecting the interests of the Commonwealth by ensuring the cooperation of that office with the Commission in the preparation of its plans for the Barre Falls dam and reservoir.

WACHUSETT WATERSHED PROTECTION

The Commission, under WPA agreements, under the provisions of Chapters 286 and 287 of 1939, has furnished the materials and engineering for the construction of sewerage systems in Rutland and Holden. The Holden system was completed and accepted by the Town on November 2, 1943, and the Rutland system on September 17, 1945. The main Rutland-Holden trunk sewer was continued in operation to divert into the Worcester sewerage system the sewage of the United States Veterans' Hospital, of the State Sanatorium in Rutland and of the towns of Holden and Rutland. Further studies for the protection of the Wachusett Watershed were continued, particularly for diverting the sewage of the towns of West Boylston and Boylston from the Watershed.

HULTMAN AQUEDUCT

The pressure aqueduct, constructed by the Commission to bring the supply from the Wachusett Aqueduct Terminal Chamber to the District, was named the Hultman Aqueduct in memory of the late Eugene C. Hultman. The construction of this aqueduct was continued under the provisions of Chapter 501 of 1938. The federal grant, acceptance of which was authorized under this legislation, amounted to a total of slightly more than $7,073,000. In October, 1940, the aqueduct was sufficiently completed so that it was possible to open it for the introduction of water from the Quabbin supply. The Commission, being of the opinion that the occasion was worthy of note and regarding it as important to the Metropolitan District as was the introduction of the Cochituate water in 1849 to the City of Boston, arranged for a dedication on October 23, by His Excellency, Governor Leverett Saltonstall. The program included an inspection of the work at Quabbin Reservoir, the Ware River Intake Works of Quabbin Aqueduct, and the Pressure Aqueduct Intake Works at Southborough. After starting the flow in the aqueduct, the inspection continued to the gatehouse at Norumbega Reservoir in Newton where luncheon was served. Addresses were delivered by Chairman Hultman, Governor Saltonstall, Mayor Maurice J. Tobin of Boston, and Federal PWA Administrator John M. Carmody.

City Tunnel

The Commission completed its Hultman Aqueduct to a point of connection with the Weston Aqueduct supply mains near the Charles River and to a shaft near the river from which the supply will be carried to Chestnut Hill by a pressure tunnel in the deep bedrock under the District, known as the City Tunnel. This extension must be completed in order for the Water District to reap the full benefit of adequate capacity to the center of distribution at Chestnut Hill and of the full pressure which will eliminate the necessity for pumping to the Southern High Service and the reliance upon old and inadequate pumping equipment. This Southern High Service supplied many important Army and Navy installations and war industries and the Commission exhausted every effort to remedy the critical situation by obtaining federal authority and assisance to proceed during the War with the construction of the City Tunnel. In spite of recommendations from His Excellency Governor Leverett Saltonstall, the Department of Public Health, Fire Chief Pope of the Boston Fire Department, General Terry of the First Corps area and from Chief of Staff John S. Barleon of the First Naval District Headquarters, and in spite of the endorsement of Regional Director Walter H. Wheeler of the War Production Board, the Commission, after continuing its efforts until late in 1942, was advised that the Federal Works Agency would not approve the project, as it was not considered essential to the War effort.

The Commission's forces spent a great deal of time in studies and designs intended to shorten the time of construction of the tunnel by the closer spacing of shafts. It has now completed its plans for the construction along the lines originally proposed and will proceed to complete the work as soon as funds are made available.

In addition to the City Tunnel, its extension to serve also the Northern High Service, a new distributing reservoir in the Blue Hills and other projects were included in a list of post-war projects for which preliminary studies have been undertaken in cooperation with the Emergency Public Works Commission, as provided in Chapter 517 of the Acts of 1943.

REAL ESTATE ACQUISITIONS

The Commission has acquired for reservoir and construction purposes and sanitary protection in the Swift River watershed a total to date of approximately 80,949 acres of land; for sanitary protection and construction purposes in the Ware River watershed, a total of about 21,097 acres; and for construction purposes along the line of the Hultman Aqueduct, 563 acres. Areas leased to the Northeastern Timber Salvage Administration were released to the Commission and the logs removed from the ponds.

WINSOR MEMORIAL

A memorial to former Chief Engineer Frank E. Winsor was dedicated on June 17, 1941. It is located on a promontary alongside the road overlooking the reservoir and Winsor Dam, and consists of a granite marker supporting a bronze bas-relief of Mr. Winsor.

LITIGATION

The office of the Attorney General represented the Commission in the trials of various petitions brought against the Commission for damages occasioned by takings as well as proceedinge in the Bills in Equity brought by the Arthur

A. Johnson Company and the Benjamin Foster Company relative to their claims for the construction of Quabbin Dike and Winsor Dam, respectively.

In 1943, all matters arising from Contract 81 with M. F. Gaddis, Inc., and the Employers Liability Assurance Corporation, Ltd., their surety, were closed and upon the payment of $1,000.00 withheld by the Commission, said payment being authorized in writing by the Attorney General, and releases being duly received by the Commission, this complicated matter was closed.

In 1944, the petition of the Ludlow Manufacturing Associates was tried before a jury in the Superior Court for Hampden County, Springfield, Massachusetts, and a verdict was returned by the jury in the sum of $239,582.90. This case is still pending as exceptions were taken by the Petitioner for adjudication by the Supreme Judicial Court.

The Supreme Judicial Court of the Commonwealth handed down an Opinion on May 7, 1945, in favor of the Commonwealth in the case of Benjamin Foster vs. Commonwealth of Massachusetts acting through its Metropolitan District Water Supply Commission. The case had been taken to said Court on Exceptions.

The Supreme Judicial Court of the Commonwealth on May 7, 1945, handed down its decision in the petition of Arthur A. Johnson Corporation vs. Commonwealth of Massachusetts, acting through the Commission. This decision upheld the finding of the Superior Court in favor of the Commission.

Contracts

During the six fiscal years, the Commission executed 47 contracts for construction work and for the furnishing of equipment. See the accompanying report of the Chief Engineer for details. The Commission also executed on May 1, 1945, a contract with the New England Power Company for the sale to that company of electricity to be generated at the Winsor Dam Outlet Works, upon completion of the installation of power generating equipment.

Special Investigation

Under the provisions of Chapter 91 of the Resolves of 1941, the Commission was represented, by its Chief Engineer, on a special commission to investigate the use of the new Metropolitan supply by additional municipalities. The proposals of the Commission resulted in the passage of Chapter 543 of the Acts of 1943, which extended the limits of the District, cut previous standby charges in half and practically eliminated entrance fees. The interest aroused led to the appointment by His Excellency, Governor Saltonstall, of a committee from representative municipalities in the Metropolitan area to study the matter further. These studies were further promoted by His Excellency, Governor Tobin, and resulted in the proposal to establish a flat wholesale rate of $40 per million gallons to all cities and towns in the Metropolitan area within reach of the distribution system, and to provide for the acquisition by the District of certain local works upon their abandonment for water supply purposes. The proposals of the Governor's committee were subsequently enacted as Chapter 587 of the Acts of 1945.

Honor Roll World War II

The roll of the Commission's employees who joined the Armed Forces in World War II contains the following names:

Albrecht, George W.
Aubey, Millard H.
Babier, Ernest W.
*Bartlett, David B.
Belknap, Harold A.
Bennett, Kenneth
Bliss, Hayward E.
Brown, Edmund H.
Brown, Henry E.
Brown Kirkwood B.
Bunker, Raymond T.
Bussey, Edward M.

Callanan, Charles M.
Calver, Arthur W., Jr.
Carey, Edmund T.

Carlson, Oscar
Chapin, Sumner R.
Chetwynd, Charles B.
Childs, Felix J.
Cifelli, Flaviano
Clark, Vern
Cobb, Edwin B.
Cole, Gardner E.
Cornell, Frank E.
Cruickshank, James
Crumb, Lloyd B.
Cushman, Frank M.
Czaga, Boleslaw

Dansereau, Harold
Davenport, Fred A.
Davidson, Warren E.
Davis, Robert H.
deLuccia, Charles A.
Delude, Albert L., Jr.
Dockham, Richard
Donovan, Frances G. (Miss)
Dorman, John W.
Dyer, Robert T., Jr.

Fernald, Joseph A.
Ferenz, William
Fielding, John A.
Fiorini, Elmer B.
Fitzpatrick, Cornelius E.
Fulchino, Carmine E.

Gafney, James F.
Graves, Frederick L.
Green, Douglas V.
Griffin, Andrew J.
Gunning, Edward

Hagan, William A.
Harris, Raymond C.
Harrison, Richard E.
Hilly, William F.
Howland, Norman
Hudson, Richard C.
Hughes, Thomas J.
Hurd, Joseph Allan, Jr.

Jacobson, Carlton S.
Johnson, Herbert C.
Johnston, Robert S.

Kelley, Walter B.
Kempt, Warren
King, Gilbert M.
King, Matthew J.
Kulig, Joseph

*LaFrance, Henry A.
Leighton, Raymond W.
Lewis, Dale
Linnekin, Osborne R.
Lufkin, Alsander

MacLeod, James H.
Malo, Theophile J.
Marden, Douglas W.
Marshall, Laurence
Mason, Ronald L.
Martin, Lloyd D.
Martin, Richard H.
McCabe, James J.
McGuine, Thomas J.
McSweeney, Richard B.
Medowski, Tadeus
Meegan, Edward
Mossberg, Roland

O'Connell, Paul
O'Connor, Harry N.
O'Malley, Charles
O'Malley, William C.
O'Toole, Joseph

Pasanen, Otto O.
Paul, William C.
Phillips, Earle D.
Pike, Stuart D.
Potter, William W.
Proud, Ernest L.
Prudente, William
Prue, Francis L.

*Quirk, William F.

Radasch, Paul E.
*Reardon, William T.
Rice, Warner
Rich, Charles J.
Roberts, Carlton N.
Rockwood, Arthur
Rosen, Bernard D.
Rowe, Francis G.
Rusiecki, Theodore S.

Segur, Willard
Skerry, Clifford
Stead, William H.
Southworth, Edwin W.
Spurr, Jerome L.
Stone, Bernard W.
Swanson, A. David
Sullivan, Donald M.
Sullivan, Robert P.

Tedford, Ralph W.
Thornton, Donald
Thornton, Elliott
Trela, Stanley

*Trowt, William A.	Vertic, John J.
Urban, Walter	Weaver, Lester R.
Urlass, Charles K.	Warren, Richard G.
	White, Merton R.
Vaitikaitis, Francis J.	Willey, Harold W.

The supreme sacrifice was made by those whose names are marked with an asterisk, which indicates a gold star.

FINANCIAL

Appended hereto is a statement of the Commission's expenditures and disbursements for the last six fiscal years and from the date of its appointment.

Under the provisions of Chapter 541 of the Acts of 1943, the Commission submitted to the Budget Commissioner estimated expenditures for allotment periods for the fiscal years commencing with 1943.

REPORTS

The reports of the Chief Engineer which have been appended to the Commission's reports for each of the six fiscal years ending November 30, 1940, 1941, 1942, 1943, 1944, and June 30, 1945, have been similarly abbreviated for the purpose of publication and the combined report is appended hereto.

Some of the earlier of the six annual reports were submitted to the General Court over the signature of members of the Commission who have since died or whose term has expired. The last of the six reports was submitted to the General Court over the signatures of

WILLIAM T. MORRISSEY, *Chairman*
EDWARD J. KELLEY, *Associate Commissioner*
CHARLES H. BROWN, *Associate Commissioner*

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

Gentlemen:—The following is a report of the engineering department for the six fiscal years ending November 30, 1940, 1941, 1942, 1943 and 1944, and June 30, 1945. There are included certain statistical and other data covering the complete calendar years.

All important items of construction in the Quabbin Reservoir area and along the Quabbin Aqueduct and the new pressure aqueduct, recently named the Hultman Aqueduct, as far as the Charles River have been completed. Minor items on which miscellaneous work is continuing include the reforestation of the Quabbin Reservoir watershed lands, seasonal clearing ahead of the rising water level, access roads, fire lanes, fencing, and the hydro-electric power plants at Winsor Dam and at Quabbin Aqueduct.

That portion of the Quabbin Reservoir construction consisting of cemetery relocation was completed September 14, 1943. Pending the completion of all the construction works, the various completed portions have been maintained and operated.

Progress was made on the record plans of the completed work. Designs were practically completed for extending the Hultman Aqueduct to Chestnut Hill by means of a deep rock tunnel from the shaft which was sunk at the Charles River marking the easterly end of that portion completed in 1941 with Federal aid; and during the early war years, upon the advice of the Federal Works Agency representative, the designs were altered to include three additional shafts in Newton in order to hasten the construction and eliminate the necessity of pumping at Chestnut Hill Reservoir. However, none of this tunnel construction was done on account of the failure to receive Federal approval which was necessary under war conditions. This failure necessitated further modifications in the tunnel design, and the plans and specifications for this extension are now ready for advertisement, although the present post-war conditions point to a much higher cost than originally provided for.

On October 30, 1941, the Legislature authorized the Commission to design and construct five projects to provide for sewage disposal needs of the north and south Metropolitan Sewerage Districts. Commencing in 1942 work has been in progress on the designs and preparation of plans, particularly for the proposed sewage treatment plant on the South Metropolitan System at Nut Island.

Organization

Stanley M. Dore, Assistant Chief Engineer, continued to act as deputy chief. He also carried out important assignments in the collection and presentation of data in connection with contractors damage claims. Walton H. Sears continued as Mechanical Engineer, in charge of designs and specifications for plant and equipment. He completed special assignments in connection with water diversion damage claims. Charles L. Coburn continued as Principal Designing Engineer until his resignation January 26, 1942. Lawrence M. Gentleman continued as Associate Civil Engineer, except for a period of war work, April 26, 1941, to February 14, 1944, in charge of the detail work on design and contract and working drawings.

William W. Peabody continued as Division Engineer in charge of the Quabbin Reservoir and Aqueduct Division, and after August 10, 1942, of the entire field organization under the Reservoir and Aqueduct Division. He retired from the service of the Commission December 15, 1944. Coleman C. McCully continued as Division Engineer, in charge of the Wayland-Weston Division until its discontinuance, and his resignation from the service, April 30, 1941. Frederick W.

Looking Across Winsor Dam from the East Abutment

Winsor Dam Spillway

Gow continued as Division Engineer, in charge of the Southborough-Framingham Division until its discontinuance October 18, 1940, then in charge of the City Tunnel Division until its discontinuance on August 10, 1942, following which he temporarily succeeded the late Samuel E. Killam as Director and Chief Water Supply Engineer of the Water Division of the Metropolitan District Commission. Since his recall, December 1, 1944, he has continued as Division Engineer in charge of the Reservoir and Aqueduct Division.

The following consulting engineers were employed from time to time by the Commission; Charles T. Main, Inc., Boston; Metcalf & Eddy, Boston; the late Samuel M. Ellsworth, Boston; James F. Sanborn, New York; Greely & Hanson of Chicago and others.

The assignment of employees under the direction of the Chief Engineer at the end of each of the last six fiscal years was as follows:

	Nov. 30 1940	Nov. 30 1941	Nov. 30 1942	Nov. 30 1943	Nov. 30 1944	June 30 1945
Headquarters Office, Designing Division, 20 Somerset St., Boston	67	38	29	29	37	37
Reservoir and Aqueduct div.						
Administration Bldg. at Winsor Dam, Belchertown	51	36	13	18	21	20
Ware River Intake Building, Coldbrook	23	23	18	18	11	11
City Tunnel Office, 107 Charles St., Auburndale	72	43	30	22	23	23
Wayland-Weston Division	55	—	—	—	—	—
Total Engineering Force	268	140	90	87	92	91

Headquarters Office

Watershed Real Estate. Reports and recommendations to the Commission were continued with respect to the purchase of real estate for Quabbin Reservoir and for the sanitary protection of the Swift and Ware River watersheds. The total acquired to June 30, 1945, for Quabbin Reservoir, including the General Taking of 74,886 acres, is 80,949 acres, distributed as shown in the following tabulation:

LOCATION OF REAL ESTATE ACQUIRED FOR QUABBIN RESERVOIR

(Title vested in Commonwealth)

Barre	22	Pelham	6,925
Belchertown	4,841	Petersham	20,851
Hardwick	5,375	Shutesbury	4,516
New Salem	29,786	Ware	8,201
Orange	55	Wendell	377

Of this total settlements have been secured covering 79,227 acres. The total acquired for the Ware River watershed protection is 21,097 acres, of which settlements have been secured covering 19,814 acres.

An appended table shows all the real estate taking plans prepared and filed to date covering the entire Quabbin and Ware development. An accompanying table shows the readjustment of town and county lines.

Hultman Aqueduct Real Estate. Of a total of 563 acres of land taken in fee and easement for the purposes of the Hultman Aqueduct, including the City Tunnel, settlements have been secured covering 560 acres.

Water Diversion Claims. The preparation of data was continued for use of attorneys in water diversion cases. Assistance, including testimony of the Chief Engineer and others, was rendered in the defense of the last of these suits that was brought by the Ludlow Manufacturing Associates, in Hampton County, November 16 to December 14, 1944.

Contract Damage Claims. The preparation of data was continued for use of attorney in the suit brought by the Arthur A. Johnson Corp., and also in a suit brought by the Benjamin Foster Co. in September, 1940.

The final opinion of the Supreme Judicial Court of Massachusetts in the Johnson suit was delivered March 30, 1945, and overruled the exceptions taken by the petitioner to the Superior Court decision in favor of the Commonwealth made April 7, 1941, which decision completely exonerated the Commission of

READJUSTMENT OF TOWN AND COUNTY LINES IN QUABBIN RESERVOIR AREA

Original Town and County	Acres Annexed To						Total Acreage in Discontinued Towns
	Hampshire County			Worcester County		Franklin County	
	Belchertown	Pelham	Ware	Hardwick	Petersham	New Salem	
Prescott, Hampshire	—	—	—	—	138	11,525	11,663
Enfield, Hampshire	1,699	1,368	4,695	—	—	3,500	11,262
Dana, Worcester	—	—	—	—	12,132	—	12,132
Greenwich, Hampshire	—	—	2,502	607	6,567	2,934	12,610
	1,699	1,368	7,197	607	18,837	17,959	47,667

any allegation of "constructive fraud" and found no breach of warranty through concealment of information in its possession as to the nature of the subsoil in borrow pits for the Quabbin Dike. The following quotation is from the Court's final decision: "He found that there was no breach of any express or implied warranty, and that neither the commission nor any of its representatives made any false representation or concealed any information whereby the petitioner was deceived or defrauded. * * * The judge found that these plans and the shovel cuts as well furnished full information that the overburden was a glacial till containing boulders and that the excavation would be fairly difficult, and that the difficulty experienced by the petitioner in excavating the area was due to the presence of boulders in the glacial till and not to the fact that the term hardpan did not appear on the plans. It would almost seem to be common knowledge that the excavation of glacial till of the character revealed by the shovel cuts in this area would not be easy."

The final opinion of the Supreme Judicial Court of Massachusetts in the Foster suit was delivered May 7, 1945, and completely upheld the contentions of the Commission as to the interpretation of the contract provisions giving the engineer control over the work. The following quotation from the Court's opinion summarizes the matter: "The problems of the desirable degree of imperviousness of the core and of the thickness and the fineness of material required to produce that degree of imperviousness and where that material could be obtained in proper quantity and proportion were strictly engineering problems which under the contract were to be solved by the engineers. For a court to substitute its own lay opinions on such matters, however well it may think itself informed through evidence, for the opinion of the engineers in the field to whom the parties have entrusted such decisions would be directly contrary to the terms of the contract and in the long run likely to produce unsound results." Furthermore, since fraud was claimed in connection with the Engineer's decisions, it should be noted that the opinion stated: "There is no finding that any of the decisions complained of was arbitrary, capricious, or tainted by compulsion or fraud."

Record Drawings. Record drawings were completed of the Spot Pond bypass, Fells Reservoir enlargement, Western Aqueduct siphons, Assabet Bridge lining, Rutland-Holden trunk sewer, Holden sewer system, Rutland Sewer system, Quabbin Aqueduct except real estate, and Norumbega Reservoir. Work on the record drawings of the Hultman Aqueduct was practically discontinued after V-E day to allow the force to concentrate on plans for post-war construction.

Hydrographic Data. Gaging stations were continued in cooperation with the United States Geological Survey on the Ware River at Colebrook, on the East Branch of the Swift River at the regulating dam, on the Connecticut River at Thompsonville, Connecticut, and on the Chicopee River at Indian Orchard; last gaging station replaces that at Bircham Bend which was destroyed by the flood of September, 1938.

Contracts and Specifications

Plans and specifications were prepared for the following contracts which were executed during the six fiscal years. That portion of the work indicated as being done under PWA contracts was included under two Federal grants, PWA Docket No. Mass. 1520-F, Mass State Project D-202, and PWA Docket No. Mass. 1551-F, Mass State Project D-208:

Contract 67, a PWA contract, for improving the access road to Shaft 9 of Quabbin Aqueduct in the Town of Barre. Six bids were received August 8, 1940, ranging from $1,546.61 to $2,000.00. The contract was executed August 27, with George E. Duteau, Springfield, Mass., the lowest bidder.

Contract 83-A, a PWA contract, for electric work in connection with alterations in the Spot Pond Pumping Station, required in connection with the Spot Pond By-Pass in the Town of Stoneham. Five bids were received September

5, 1940, ranging from $1,048.00 to $2,335.00. The contract was executed September 20, with the John J. Reddington Electric Service Company, Boston, Mass., the lowest bidder.

Contract 84, a PWA contract, for constructing the head house at Shaft 4 of the Southborough Tunnel to house the six 72-inch Dow-disc operating valves on the new pressure aqueduct. Five bids were received September 12, 1940, ranging from $104,986.53 to $125,616.40. The contract was executed September 18, with John F. Griffin Co., Cambridge, Mass., the lowest bidder.

The tunnel unwatering pump chamber at the bottom of the shaft is designed to use the same 900 H.P. motor as is used for a similar purpose at the bottom of Shaft 1 of Quabbin Aqueduct.

Contract 94, a PWA contract, for sinking a caisson to sound ledge for the Charles River shaft of the pressure aqueduct, Shaft 5, in the Town of Weston. Thirteen bids were received February 5, 1940, ranging from $215,548.45 to $390,267.50. Four were from New York contractors, one from Pennsylvania, one from New Jersey and the remainder from Massachusetts. The contract was executed February 20, with John MacDonald Construction Company, Newton, Mass., the lowest bidder.

Contract 96, a PWA contract, for constructing a chlorine storage house and appurtenances and furnishing and installing emergency chlorine equipment at Norumbega Reservoir in the Town of Weston. Twenty bids were received February 1, 1940, ranging from $48,387.00 to $76,357.00. The contract was executed April 5, with the Chandler Construction Company, Boston, Mass., the lowest bidder.

Contract 97, a PWA contract, for furnishing a Diesel engine-driven pumping unit for Bear Hill Service at the Spot Pond Pumping Station. Five bids were received March 21, 1940, ranging from $14,236.00 to $17,077.77. The contract was executed April 22, with Ralph P. Hall, Inc., Boston, Mass., the lowest bidder.

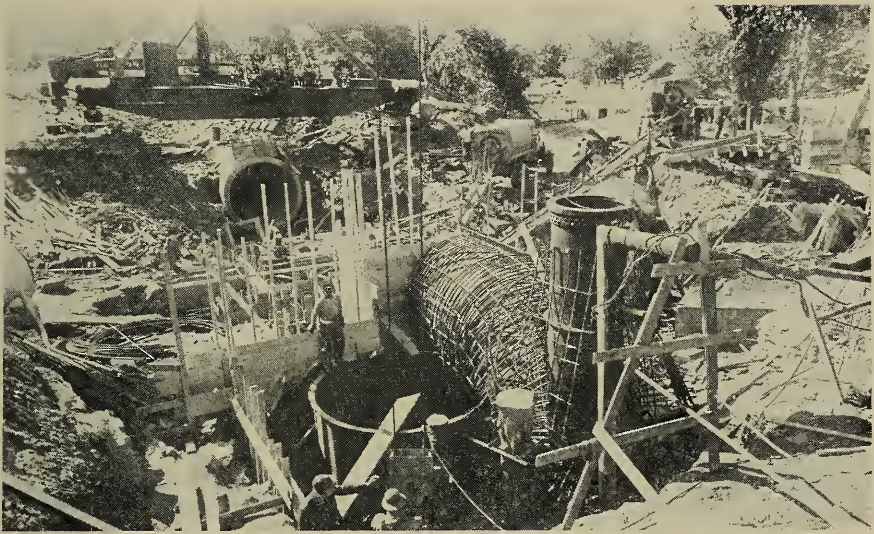
Contract 99. A PWA contract, for enlarging the Fells Distribution Reservoir of the Northern High Service in the Town of Stoneham and cities of Malden and Melrose. Eleven bids were received December 21, 1939, ranging from $134,380.93 to $199,156.85, all from Massachusetts contractors except one from New Jersey. The contract was executed January 9, 1940, with the Middlesex Construction Company, Framingham, Mass., the lowest bidder.

Contract 101, a PWA contract, for bronze tablets marking structures built under the Federal loan in the towns of Barre, Belchertown, Marlborough, Ware, West Boylston and Weston. Three bids were received January 11, 1940, ranging from $397.68 to $1,094.17. The contract was executed January 30, with the Dimond-Union Bronze Works, Boston, Mass., the lowest bidder.

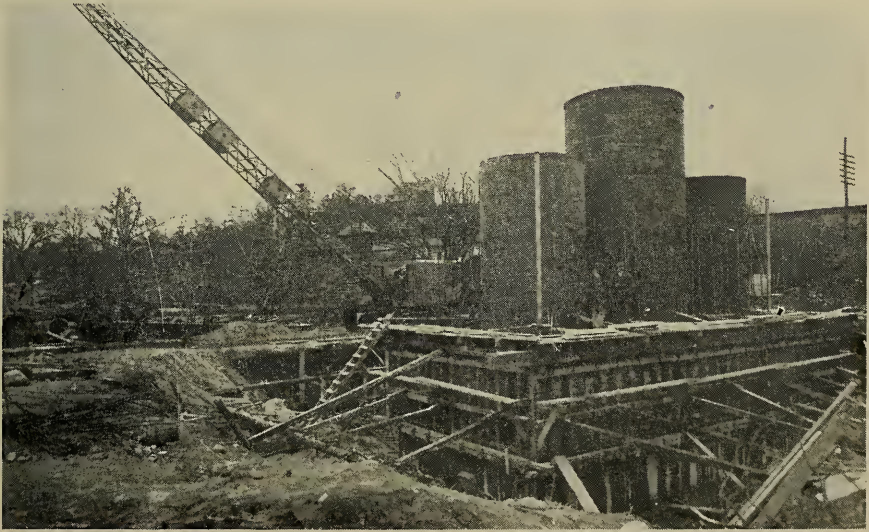
Contract 102, a PWA contract, for alterations to property of the Commission, formerly known as the Sauer House in Belchertown, near the Administration Buildings. Nine bids were received June 6, 1940. This contract consisted of four items: Item 1, for linoleum, $80.50, executed August 3, with the Springfield Floor Covering Center, Springfield; Item 2, for plumbing, $615.00, executed July 11, with R. G. Harrington, Ware; Item 3, for heating, $578.00, executed July 11, with The Mutual Plumbing and Heating Company, Amherst; Item 4, for electrical work, $251.00, executed August 3, with the Springfield Electrical Company, Inc., Springfield, each bidder the lowest for the item in question.

Contract 103, a PWA contract, for furnishing a work boat for use on Quabbin Reservoir. Five bids were received October 10, 1940, ranging from $12,975.00 to $16,711.00. The contract was executed October 25, with the Quincy Adams Yacht Yard, Inc., Quincy, Mass., the lowest bidder.

The bids on this contract were received as the result of a readvertisement. Previously on September 12, 1940, four bids were received, ranging from $8,985.00 to $18,711.00. The contract was awarded to the lowest bidder, who defaulted on his bid bond; and all other bids were rejected and the contract readvertised.



Contract 74. Constructing the Connection between Uptake Shaft 4 and the Cut and Cover Aqueduct



Contract 94. Sinking Caisson for Charles River Shaft, Hultman Aqueduct

This 46-foot boat, the "Enfield", was designed in cooperation with Marine Architect George Owen of the Massachusetts Institute of Technology for a top speed of 12 statute miles per hour

Contract 105, a PWA contract, for furnishing and installing lightning protection systems on the Commission's Buildings in the towns of Barre, Belchertown, Hardwick, Marlborough, Rutland, Southborough, Weston and West Boylston. Four bids were received May 29, 1941, ranging from $4,135.00 to $9,420.00. The contract was executed June 4, with the Boston Lightning Rod Company of Boston, Mass., the lowest bidder.

Contract 106, a PWA contract, for improvement of access roads in the Quabbin Reservoir area in the towns of Hardwick, Petersham, New Salem and Belchertown. Five bids were received May 16, 1940, ranging from $28,298.71 to $38,562.39. The contract was executed June 5, with A. R. Montuori & Co., Fitchburg, Mass., the lowest bidder.

Contract 107, a PWA contract, for constructing buildings on Quabbin Hill in the town of Ware. Two bids were received November 7, 1940, for $71,165.00 and $81,141.00 The contract was executed December 2, with H. P. Cummings Construction Company, Ware, Mass., the lower bidder.

These buildings were designed in cooperation with Consulting Architects Densmore, LeClear and Robbins. The main building houses the two-way radio equipment connected by direct wire from the administration building. It includes a tower, extending to a height of 81 feet above the summit, which supports the radio mast, provides a lookout for spotting fires in the reservoir areas, and an observation point for the general public. There is also a public toilet building east of the summit and conveniently near the Quabbin Hill parking area.

Contract 108, a PWA contract, for constructing docking facilities consisting of a utility wharf and ramp, in a protected bay at the east end of Winsor Dam in the Town of Ware. Four bids were received September 12, 1940, ranging from $18,117.75 to $25,100.95. The contract was executed September 27, with J. J. Callahan, Boston, Mass., the lowest bidder.

Contract 109, a PWA contract, for furnishing and installing a two-way radio system for use in the protection of the District's watersheds and aqueducts in the towns of Ware, Belchertown, Pelham, Barre, Clinton and Southborough. Five bids were received, October 17, 1940, ranging from $20,341.92 to $28,301.25. The contract was executed October 30, with Kenworthy & Taylor, Inc., of Everett, Mass., the lowest bidder.

The system includes points of communication in the building on the summit of Quabbin Hill, in patrol automobiles operating in the watershed area, at the Ware River intake works, Wachusett Dam and Sudbury Dam, and permits communication with the existing Metropolitan District police installations in Boston.

The equipment consists of five fixed stations in the towns of Belchertown, Ware, Pelham, Barre, Clinton and Southborough, and nine mobile units comprising six patrol cars, two boats and one fire truck.

Contract 110, a PWA contract, for completing the excavation of the Charles River Shaft of the new pressure aqueduct in the town of Weston. Seven bids were received August 29, 1940, ranging from $261,282.57 to $412,293.00. All were from Massachusetts contractors except one from Maryland. The contract was executed September 13, with C. & R. Construction Company, Boston, Mass., the lowest bidder.

Contract 111, a PWA contract, for constructing the superstructure of the outlet works at Winsor Dam in the Town of Belchertown. Six bids were received October 3, 1940, ranging from $47,788.23 to $62,219.50. The contract was executed October 18, with Chandler Construction Company, Inc., Boston, Mass., the lowest bidder.

Contract 112, a PWA contract, for constructing a spillway at the top of Shaft 2 of Quabbin Aqueduct in the Town of Holden. Twelve bids were received August 29, 1940, ranging from $6,671.05 to $12,768.70. The contract was executed September 16, with the Wachusett Engineering Company, Inc., Fitchburg, Mass., the lowest bidder.

Contract 113, for making core borings for subsurface investigations along the line of the proposed pressure tunnel from the Charles River Shaft, in the counties of Middlesex, Norfolk and Suffolk. Six bids were received July 23, 1940, ranging from $14,839.30 to $27,918.90. They were from contractors in New York, Pennsylvania and Indiana. The contract was executed August 6, with Riley Engineering and Drilling Company, Brooklyn, New York, the lowest bidder.

Contract 114, for making core borings for subsurface investigations at additional shaft sites on the line of the proposed City Tunnel in the City of Newton. One bid was received August 24, 1942, for $4,200.00. The contract was executed August 27, with B. F. Smith & Co., Inc., of Boston, Mass., the only bidder.

Contract 116, a PWA contract for the construction of a building for storage and for public toilets in Quabbin Park Cemetery in the Town of Ware. Five bids were received October 17, 1940, ranging from $10,735.00 to $12,584.00. The contract was executed October 25, with Chandler Construction Company, Inc., Boston, Mass., the lowest bidder.

This building was designed in cooperation with the late Frederick Kingsbury, Consulting Architect.

Contract 118, for the construction of stone masonry posts and walls and other miscellaneous work at Winsor Dam and Quabbin Dike in the towns of Belchertown and Ware. Two bids were received October 15, 1942, for $4,979.30 and $9,459.80. The contract was executed October 22, with A. R. Montuori of Fitchburg, Mass., the lower bidder.

Contract 119, for furnishing and setting two granite pylons, one in the traffic circle at each end of Winsor Dam in the towns of Ware and Belchertown. Four bids were received April 24, 1941, ranging from $4,588.00 to $7,900.00. The contract was executed May 13, with W. C. Canniff & Sons, Inc., Boston, Mass., the lowest bidder.

Contract 120, for drilling a well for the water supply of the buildings on Quabbin Hill constructed under Contract 107 in the Town of Ware. Two bids were received August 8, 1940, for $800.00 and $1,820.00. The contract was executed August 15, with R. E. Chapman Company, Oakdale, Mass., the lowest bidder.

Contract 124, a PWA contract, for the construction of a transmission line between the Winsor Dam Outlet Works in Belchertown and the Utility Building on the top of Quabbin Hill, in the Town of Ware. Three bids were received January 16, 1941, ranging from $15,142.00 to $17,940.00. The contract was executed February 3, with George W. Ellis Company, Inc., Boston, Mass., the lowest bidder. The contract had been previously advertised and bids opened December 5, 1940. The same three bidders submitted bids ranging from $15,697.00 to $32,152.00, which were rejected as being too high.

Contract 125, for constructing in the Town of Belchertown on the ramp in front of the administration building leading from the seaplane hangar into Quabbin Reservoir, a marine railway and equipment for the launching and hauling out of boats and seaplanes. One bid was received August 21, 1941, for $8,000.00. The contract was executed August 25, with the Berke-Moore Company of Newton, Massachusetts, the only bidder

Contract 127, for furnishing and installing the switchboard equipment in the District's Sudbury Dam power plant in the Town of Southborough required in conjunction with the operation of the gate house constructed under Contract 84. Three bids were received July 17, 1941, ranging from $2,263.00 to $2,439.00. The contract was executed July 18, with A. C. Senecal Co., Westboro, Mass., the lowest bidder.

Contract 129, a PWA contract, for constructing a drainage pipe line across the pressure aqueduct in the Town of Weston. Eleven bids were received February 12, 1941, ranging from $475.00 to $1,447.00. The contract was executed March 6, with John Williams, Dorchester, Mass., the lowest bidder.

Contract 130, a PWA contract, for grading, loaming and grassing and the improvement of access roads in the vicinity of the pressure aqueduct works in the towns of Marlborough, Southborough and Weston. Five bids were received May 1, 1941, ranging from $6,706.61 to $8,862.98. The contract was executed May 5, with the Lee Crane Service, Inc., Boston, Mass., the lowest bidder.

Contract 148, for the sale and purchase of electric energy to be developed at Winsor Dam in the Town of Belchertown. This contract, executed May 1, 1945, was negotiated with the New England Power Company. Its principal provision is for the sale of electricity at the Outlet Works at 22,000 volts, for 6.25 mills per Kwh. from 7:00 A.M. to 11:00 P.M., Monday to Friday, inclusive, and during at least seven hours on Saturday.

Contract 149 (A, B, C, D, E, F), for furnishing and delivering a waterwheel, generator, switchgear, transformer, substation and appurtenances in the Town of Belchertown. Bids were received May 31, 1945:

(A) Two bids were received for the 700 H.P. single-runner vertical hydraulic turbine, for $27,953.00 and $29,497.00. The contract was executed June 25, with S. Morgan Smith Co., York, Pa., the lower bidder.

(B) Three bids were received for the 1500 Kva. 2400-volt generator, ranging from $17,192.00 to $17,861.00. The contract was executed June 16, with the Electric Machinery Mfg. Co., Minneapolis, Minn., the lowest bidder.

(C, E, F) Two bids were received for the switchgear, substation and storage battery ranging from $15,008.00 to $15,294.36. The contract was executed June 21, with the General Electric Co., Lynn, Mass., the lower bidder.

(D) Three bids were received for the 1500 Kva. 22000 to 2400-volt transformer, ranging from $4,299.00 to $4,770.00 The contract was executed June 25, with the Erie Electric Co., Buffalo, N. Y., the lowest bidder.

In addition, plans and specifications were prepared for six minor PWA equipment contracts numbered 95, 104, 121, 122, 123 and 128, for furnishing valves, cranes and other equipment required for the pressure aqueduct, for the enlargement of Fells Reservoir, and for Bear Hill Service at the Spot Pond Pumping Station, all of which were executed.

Some of the more important items are:

One 20-ton hand operated bridge crane at the Winsor Dam Outlet Works. One 20-ton hand operated bridge crane at the Hultman Aqueduct Control Works, equipped with a 7½-ton auxiliary electric hoist to serve the deep dry well and pump chamber at the bottom of Shaft 4. One Diesel engine-driven 5 m.g.d. capacity pump at the Spot Pond pumping station, for Bear Hill Reservoir Service.

Designs

Studies and designs were continued of structures proposed to be constructed but not yet placed under contract, as follows:

Winsor Dam.—Designs were completed in cooperation with the late Frederick Kingsbury, Consulting Architect, for improvements at the entrances to Administration Road.

Power Development.—Supplementing the designs completed for the Winsor Dam Outlet Works, studies were continued of the development of power in the new station at the outlet works of Quabbin Aqueduct and of the benefit of the new supply to the power development in existing stations.

Quabbin Aqueduct.—Studies were made of the installation of gates at the bottom of Shaft 4 which will make it possible to prevent excessive waste over the spillway at Shaft 2, so that even in extreme floods practically the entire diversion from the Ware River intake works can be discharged into Quabbin Reservoir at Shaft 11A. One-way shutters of an improved type were designed and were purchased in 1940, and installed in the headworks at Shaft 11A, which is the outlet from the aqueduct into Quabbin Reservoir for the diversions from the Ware River. Designs were completed of ventilating equipment and other accessories required for the installation in 1941 in the service building at Shaft 8 of the gasoline-driven electric generator previously used in the Commission's laboratory in Enfield. Designs were completed for a catwalk outside the Ware River Intake Building to facilitate the removal of debris from the course rocks. The necessary material was purchased and installed in 1945.

Quinapoxet River Diversion.—Studies were completed in 1940 relative to diverting into Quabbin Aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir. Such diversion was found to be uneconomical and the Quinapoxet River will be allowed to flow into the Wachusett Reservoir as at present.

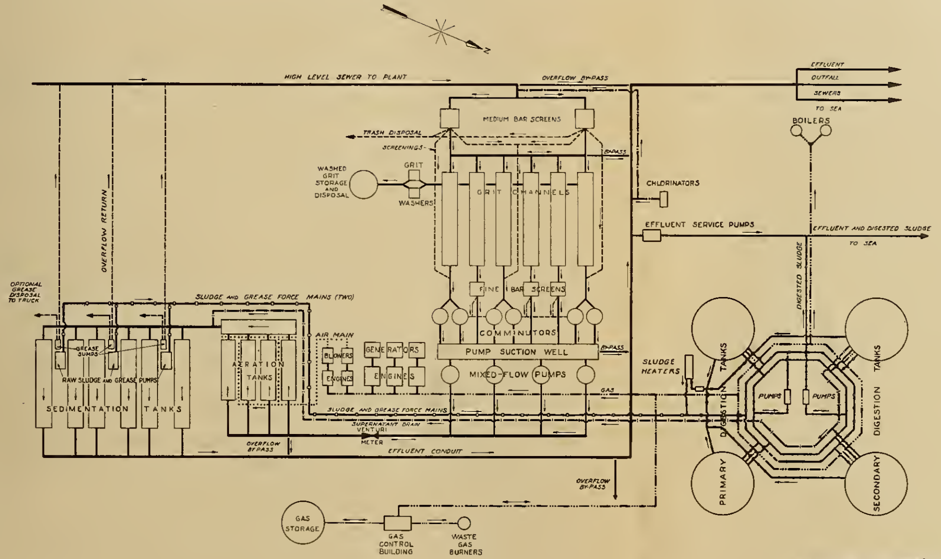
Wachusett Watershed Protection.—Designs were completed in 1942 of improvements and additions to the Rutland Sewer system and of a sewage ejector station to permit the extension of the Holden sewer system to low areas not formerly included. Studies were made in cooperation with the Quabbin Reservoir and Aqueduct Division of a system for diverting from the watershed of Wachusett Reservoir the sewage of West Boylston and Boylston.

Wachusett Service Building.—Studies and designs were completed in 1941 in cooperation with the Quabbin Reservoir and Aqueduct Division for alterations in the property of the Commission formerly known as the Spa Building near the south abutment of Wachusett Dam to make provisions for public toilets for the housing of maintenance personnel and for the installation of radio equipment for the use of the Metropolitan police. Six bids were received January 29, 1942, ranging from $10,475.00 to $14,571.00. They were rejected as being too high, and no construction was undertaken.

Hultman Aqueduct—City Tunnel.—As already described in this report, designs were practically completed for the City Tunnel from Shaft 5 at the Charles River to Chestnut Hill to eliminate as as soon as possible the necessity of pumping to the Southern High Service. Various shaft sites were studied and borings were made to determine the depth and character of the bedrock not only along the line of the tunnel to Chestnut Hill but also along a portion of a proposed future tunnel loop under the water district which would extend northeasterly from the unwatering pump chamber at the bottom of Shaft 5, because the requirements for unwatering this future tunnel loop have an important effect on the depth of this shaft and of the Tunnel. Sufficient progress was made on studies for additional borings now needed so that a contract for these subsurface investigations was advertised for the opening of bids on July 3, 1945. Designs were made for water supply connections from the shaft heads, particularly from the top of Shaft 8 at Chestnut Hill. Studies were made of the hydraulics of the proposed future tunnel loop and its relation to the design of the City Tunnel; and studies were made to coordinate the City Tunnel plans with a possible future extension of the distribution tunnel to the northern high service to eliminate the necessity of pumping at Spot Pond.

Distributing Reservoirs.—Studies and preliminary designs were made for modification of, and new connections to, existing distributing reservoirs, which must follow the completion of the City Tunnel; also for an additional distributing reservoir in the Blue Hills reservation which would be a much needed appurtenance of the tunnel.

Barre Falls Flood Control Project.—In connection with the flood control project, which the federal government is planning at Barre Falls in the Ware River watershed, the Chief Engineer of the Commission was appointed as a member of an advisory board to assist the State Planning Board in its studies and recommendations to His Excellency the Governor on this and other similar Massachusetts projects. Studies were commenced in 1945 of the Barre Falls Project



COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION (AS ENLARGED)
SOUTH METROPOLITAN SEWERAGE DISTRICT
NUT ISLAND SEWAGE TREATMENT WORKS
NUT ISLAND PLANT
FLOW DIAGRAM

and of the extent to which the federal proposals conflict with the interests of the Commission in the diversion of the flood flows of the Ware River into Quabbin Aqueduct.

Neponset Valley Investigation.—The Chief Engineer of the Commission was appointed as a member of an advisory board of engineers for the Joint Board appointed by the Legislature in 1944, consisting of the Metropolitan District Commission and Department of Public Health studying methods to improve the conditions of the Neponset River. The Board was continued by the 1945 legislature, and the Metropolitan District Water Supply Commission included therein. Studies were commenced of the possibility of diverting into the Charles and Neponset rivers, water from some of the Water District's old sources which will be surplus upon completion of the Quabbin development and the Hultman Aqueduct.

Enlargement of Metropolitan Water District.—Studies were made and considerable data assembled for, and assistance rendered to, the subcommittees on finance and on technical matters of the Special Committee appointed in 1944 by His Excellency the Governor to consider the greater use of the sources of the water supply of the Metropolitan Water Dstrict.

Assistance was also rendered to various committees of the General Court in their consideration of the Special Committee's proposals. This resulted in a further amendment of the General Laws affecting the conditions of entrance into the Metropolitan Water District and encouraging new cities and towns to join. This was accomplished mainly by reducing the annual assessments, commencing in 1946, to a flat rate of $40 per million gallons by the annual issue of so-called water-use-development bonds which, in effect, delay the too rapid reduction of the water debt and correct a situation caused primarily by the previous financing of the new Quabbin development with bonds of too short a term considering the permanent character of the works.

Sewerage Projects

Studies were commenced in 1942 on the five projects listed in Chapter 720, Acts of 1941, and amended by Chapter 705 of the Acts of 1945, for the improvement of the Metropolitan Sewerage Systems.

Project 1—Nut Island Treatment Works.—Sufficient progress was made on the designs for the proposed sewage treatment plant at Nut Island so that plans and specifications for the fill and appurtenances necessary to prepare the site were practically completed, and the contract was advertised for the opening of bids on September 27, 1945. Prior thereto and following a public hearing by the Division of Waterways of the Department of Public Works on March 20, 1945, all necessary permits were granted by that department and by the United States Engineer Office. Following a public hearing on August 13, 1945, the plans for the project were approved by that department on August 15, 1945.

The plan is outlined in a flow diagram attached hereto, and is designed to remove floating solids and grease, to reduce the amount of suspended solids by detention in sedimentation tanks, for about 1½ hours at the design rate of 112 m.g.d., preceded by about 20 minutes' aeration, to materially reduce bacterial pollution of the harbor and shore waters by chlorination of the effluent during the recreational season, and to digest the sludge and utilize the gas therefrom for low-lift pumping and other plant needs. The digested residue from such a plan is in the form of innocuous humus, and designs are in progress for the disposal of as much of this as is practicable in the form of low-grade fertilizer, and of the remainder through a new deep sea outfall, with provision for taking the digested residue from any future similar treatment plant on the Boston Main Drainage System, which may be built by the City of Boston at or near its Calf Pasture or Moon Island works. Other designs not shown on the flow diagram provide for the construction of diffusers over the outlets of the existing outfall discharge lines so that the treated effluent will be well mixed with the harbor waters at the point of disposal.

The contract was prepared for the making of subsurface investigations to obtain information in addition to that previously available at and near the foundations proposed for the Nut Island works. Bids were opened May 11, 1945. Only one informal bid was received and since this anticipated paying maximum rates of wages allowed under existing Federal regulations, which were lower than the minimum prescribed by the State Commissioner of Labor and Industries, it was impossible to proceed. The necessary investigations were made with a boring rig constructed and manned by the Commission's own forces. Soundings offshore were also made which show that the necessary filling of the site could not be satisfactorily made with material dredged in the vicinity.

South Metropolitan Sewage Records.—For about two years, twenty-four-hour composite samples have been collected at about 8-day intervals for analysis of the amount of suspended solids to be expected. Through the courtesy of the Department of Public Health, these samples were analyzed at the Lawrence Experiment Station until the latter part of February 1945, thereafter at the Commission's Park Road Laboratory at Weston.

Projects 4 and 5—Charles River Basin Storm Overflow Conduits.—In connection with the marginal conduits on either side of the Charles River and the projected storm overflow relief conduits, inspections and studies were initiated in 1944. Inspections were made of overflows and water courses on both sides of the Charles River.

Boston Marginal Conduit.—A recording level gage was installed in the Fens Gatehouse in 1944 to assist in studying the performance of the conduit and its overflows under different tidal conditions. The Parks Division of the Metropolitan District Commission has cooperated fully in these studies and, following recommendations by the Commission's Chief Engineer, a contract was awarded by the Division to revamp the Fens Gatehouse at the entrance to the Boston Marginal Conduit. This work included the reconstruction of the tide gates to the Charles River Basin and the installation of electric motors for the satisfactory operation of the sluice gates controlling the flow entering the gatehouse from the Stony Brook conduits of the City of Boston. Large quantities of floating debris were removed at the Fens Gatehouse, and the difficulties in operation will continue until adequate means are provided for the mechanical removal of such debris from the larger Stony Brook conduit, particularly in times of high rates of storm run-off in this conduit.

Cambridge Marginal Conduit.—Recording level gages were installed in the Charles River Dam gatehouse on the Cambridge Marginal Conduit and on the Bridge Street Sewer in June, 1945, to assist in studying the performance of the conduit. The Parks Division has cooperated to the fullest extent in carrying out recommendations of the Commission's Chief Engineer with respect to the control of the gates so as to materially lessen the overflow from the Cambridge Marginal Conduit into the Charles River Basin.

Progress of Contracts

The following construction work was not included in any of the three field divisions but on account of its location was carried out under the supervision of the headquarters office.

Contract 83.—Contract 83, for constructing the Spot Pond By-Pass was coninued to completion. In addition to 298 sections already laid under this contract, 71 sections of 60-inch steel-cylinder reinforced concrete pipe were laid, the last section of which was placed January 16, 1940, to complete the line 4,357.4 feet in length. The average number of pipe sections placed per day was two. The connection to the existing 60-inch cast-iron line feeding Spot Pond was completed February 28, and the connection at the north end of the by-pass to the 48-inch line out of Spot Pond near the pumping station April 24. Refill closely followed pipe laying, and after all pipe was laid the line was caulked by hand and the inside mortar joints placed by hand and troweled. The 60-

inch line was satisfactorily tested for water tightness as soon as the connections were completed. Very satisfactory results were obtained; namely, 31 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head.

Excavation behind sheet piling for the control chamber for the new supply lines was commenced March 4, 1940, just north of the pumping station. Rock excavation around the existing pipes where blasting could not be permitted, slowed up progress in excavating but this was completed and the concrete mat poured on May 6. The existing 48-inch mains at this location were then taken out and reset to include gate valves, check valve and automatic Dow-disc valve, all of which are housed in the control chamber. After the pipe was set and put into temporary operation, the concrete walls were built in three lifts and finally the roof was poured June 21. The contract was accepted as substantially complete July 15, 1940, except for minor items, and all work was completed early in 1941.

The final estimate dated April 9, 1941, was for $141,894.22. The contractor's force in 1940 averaged 13 men, the maximum being 21 for the week ending December 23, 1939.

The only major item of plant added was a one-yard speed crane hired from time to time to handle heavy castings at connections.

The total work done and materials furnished under the principal items of Contract 83 are as follows:

Earth excavation and refill	12,270 cu. yds.
Rock excavation	4,200 " "
Furnishing and laying 60-inch pre-cast concrete pipe	4,357 lin. ft.
Furnishing and laying miscellaneous cast-iron pipe and specials	117,700 lbs.
Reinforced concrete	300 cu. yds.
Miscellaneous concrete	280 cu. yds.
Portland cement	1,380 bbls.
Miscellaneous iron and steel	40,000 lbs.
Caring for and setting metal work furnished by the Commission	158,000 lbs.
Permanent fencing	4,260 lin. ft.

Important work was done under this contract by the Security Fence Company, subcontractor for fencing.

Contract 83A.—Work under Contract 83A, for electric wiring of the alterations in the Spot Pond Pumping Station, was started October 9, 1940 and completed May 2, 1941, at which time a final inspection of the automatic operation of the valves and appurtenances in connection with Spot Pond By-Pass was made.

The final estimate, dated June 4, 1941, was for $1,095.00. The contractor's force averaged two men for three weeks.

Contract 85.—Contract 85, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston, was continued to completion. At the beginning of 1940, only 9.6 per cent of all the 12-foot 6-inch pipe and 10.7 per cent of all the 11-foot 6-inch pipe remained to be delivered. All deliveries were completed February 9, except for certain special filler pieces, the necessary measurements for which were delayed by the operations of the laying contractors until June 13, 1940.

The final estimate dated October 15, 1940, was for $4,198,409.03. The contractor's force averaged 50 men, the maximum being 322 for the week ending December 2, 1939.

Contract 99.—Contract 99, for enlarging the Fells Distribution Reservoir, involved the construction of three earth dams of fairly large size and two smaller ones. It included the breaching of one of the original dams so as to connect the existing reservoir with one of the two new basins created. It included also two concrete gate structures in the two largest new dams to provide for unwatering the new basins and to provide also for possible connection to a future deep pressure tunnel distribution loop. Construction began promptly with the excavation to Bedrock along the dam center line. The rock surfaces were thoroughly cleaned and a concrete cut-off wall poured, consisting of a blanket 8 to 10 feet wide with two parallel projecting fins. Above the concrete the cut-off was constructed of impervious material from borrow areas in the vicinity, rolled in place by a sheep's-foot roller. The remainder of each embankment outside the core was constructed of pervious material purchased by the Contractor from gravel pits in Stoneham and Woburn. On the upstream slope screened gravel and riprap and on the downstream slope loam or soil were placed as the embankment was built up. An access gravel roadway was built around the new basins and across the top of all the dam protected on either side by boulder guard rail and surfaced with an application of sand and tar, one-half gallon to the square yard. The basins in the enlargement were excavated to ledge or to clean sound material by the removal of all loam, subsoil, roots, etc., so that they could be put into use with a minimum of delay. To this end the exposed ledge areas were washed clean and such areas near the dam embankments which contained seams were covered with gunite.

The work of placing impervious embankment was started May 13, 1940, and pervious embankment May 31, and all these embankments were completed August 26. Soil dressing and seeding was completed October 10 and gravel surfacing of the roadway September 23. Placing of screened gravel on the upstream face was started June 7, and all the riprap completed September 26. Concreting operations were started April 24 and completed September 6. Connections from the new isolated basin to the old gate chamber and to a sluice gate in one of the new dams for possible future connection were made by using some of the 60-inch cast-iron pipe removed under contract 77 from the old connections to the Weston Aqueduct head chamber.

The final estimate, dated December 17, 1940, was for $145,115.80.

The principal items of plant were as follows:

4 Power shovels
4 Caterpillar bulldozers
1 Trench digger
1 Power grader
1 Sheep's-foot roller
Miscellaneous air compressors, pumps, trucks, etc.

The total work done and materials furnished under the principal items of Contract 99 were as follows:

Clearing	20	acres
Stripping	18,620	cu. yds.
Earth excavation	7,000	cu. yds.
Rock excavation	2,310	cu. yds.
Rolled impervious embankment	31,460	cu. yds.
Consolidated impervious embankment	13,600	cu. yds.
Soil dressing	1,500	cu. yds.
Riprap	3,500	cu. yds.
Concrete	1,290	cu. yds.
Portland Cement	2,090	barrels
Fencing	6,000	lin. ft.

Important work was done under this contract by the American Chain Link Fence Company, subcontractor for fencing.

Contract 101.—Work under Contract 101 consisted of furnishing and erecting bronze tablets in the towns of Barre, Belchertown, Marlborough, Ware, West Boylston and Weston. Eight tablets were delivered and erected.

The final estimate, dated July 16, 1940, was for $397.68.

Contract 103.—Work under Contract 103 consisted of furnishing, equipping and delivering a work boat for use on Quabbin Reservoir. The keel was laid in October, 1940, and the boat was delivered by truck from Quincy to Belchertown on April 16, 1941. It was launched the next day, following which satisfactory performance tests were made.

The final estimate dated June 24, 1941, was for $13,461.00.

Contract 105.—Work under Contract 105, for furnishing and installing lightning protection systems on the Commission's buildings, was commenced July 7, 1941, and was completed before the end of the year except for certain minor tests.

The final estimate dated January 22, 1942, was for $4,335.00. The contractor's force averaged 4 men for 10 weeks.

Contract 109.—Work under Contract 109, for furnishing and installing a radio system, was started November 18, 1940, at the Ware River intake works station. Work at all stations in Ware, Belchertown, Pelham, Barre, Clinton and Southborough was completed and satisfactory final tests were made September 10, 1941.

The final estimate dated November 27, 1941, was for $20,988.60.

Contract 113.—Work under Contract 113, for making core borings in the counties of Middlesex, Norfolk and Suffolk, was started in August, 1940. It consisted of making about 6,000 feet of core borings along the line of the proposed future distribution tunnel loop to supplement borings made under Contract 58 along the two branches of the loop which will drain toward the Charles River shaft. About 4,730 feet of core borings were completed in 1940 and 1,460 feet in 1941, making the total under the contract 6,190 feet.

The final estimate dated April 18, 1941, was for $13,553.46. The contractor started with two boring rigs and ended with three, using a maximum of five. His force averaged eight men for 26 weeks.

Wayland-Weston Division

The Wayland-Weston Division continued in charge of the field work in connection with Section 4, 5 and 6 of the pressure aqueduct and of their construction, including the Norumbega high-level distributing reservior and the additional pipe lines in the Weston Aqueduct siphons. All work was done in cooperation with the Framingham office of the Water Division of the Metropolitan District Commission, Israel P. Aubey, Superintendent. This division was discontinued April 30, 1941, upon the completion of all construction work, and the maintenance of this easterly half of the aqueduct was turned over to the City Tunnel Division.

Miscellaneous Office Work

Periodical estimates for Contracts 78, 79, 80, 81, 89 and 96, and final estimates for Contracts 73, 78, 79, 81, and 89 were prepared. Proposed plans for real estate settlements were prepared, and other miscellaneous plans included those for additional land takings and for a considerable area in the vicinity of Dudley Pond. Estimates of the capacity of the upper and lower basins of Norumbega Reservoir were made. Geologic profiles along the pressure aqueduct were drawn. Record drawings of the reservoir and portions of the aqueduct were in progress.

Miscellaneous Field Work

Lines and grades were given for Contracts 73, 78, 79, 80, 81, 89, 96 and 129. Surveys were made for miscellaneous properties along the pressure aqueduct line including additional real estate takings, and for a profile along the finished aqueduct line. A small labor force was employed on miscellaneous work including the setting of stone bounds, the grouting of foundations of the embarkments of Norumbega Reservoir, clearing the margins of the Reservoir, landscaping and constructing drains. Geological studies were continued.

Progress of Contract

Contract 73.—Contract 73, for constructing inverted pipe siphons on the Weston Aqueduct, was continued to completion in the spring of 1940. The work consisted of finishing several items of work which could not be done while the ground was frozen.

The final estimate dated July 19, 1940, was for $261,467.58. The Contractor's force was 12 men in the first week of May, 1940.

Contracts 78 and 79.—Contracts 78 and 79, for constructing Sections 4 and 5, respectfully, of the cut-and-cover pressure aqueduct, were continued to completion. Contract 78 was accepted as substantially complete on July 15, 1940, and Contract 79 on June 3. The placing of the 11-foot 6-inch diameter steel-cylinder reinforced concrete pipe, in sections 16 feet long and weighing from 40 to 50 tons each, continued on Section 4 by the method previously described, with a gantry crane, until December 21, 1939, when the last 16-foot length was laid. A closure piece placed January 12, 1940, completed the pipe laying. During the period from December 1 to 21, 1939, 341 sections were laid in 20 working days of eight hours, the average being 17 and the maximum 32 on December 5.

During the winter, work continued on the caulking and mortaring of the pipe joints, the building of concrete valve chambers, manholes, culvert headwalls and miscellaneous structures and the setting of blowoff gates and air valves. The work of final grading, loaming, seeding and fencing was resumed about the middile of April, 1940.

Water for testing was pumped into the line from the Framingham water supply. Very satisfactory results were obtained, namely, 22.2 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head. The entire length built under Contracts 78 and 79 was tested at one time between temporary dished steel bulkheads at the west end of Section 4 and at the east end of Section 5. To determine the proportion of leakage between the two contracts a current meter was installed in an orifice in a temporary wooden partition between two sections.

The final estimate on Contract 78, dated November 7, 1940, was for $551,629.18. The final estimate on Contract 79, dated September 30, 1940, was for $522,335.25. The contractor's force averaged 112 men, the maximum being 360 for the two weeks ending December 16, 1939.

The total work done and materials furnished under the principal items of Contracts 78 and 79 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under these contracts.

American Chain Link Fence Co	Fencing
Pneumatic Concrete Corp.	Guniting and mortar lining

Contract 80.—Contract 80, for constructing the Norumbega high-level distributing reservoir, was continued to completion. Excavation of ledge for the twin aqueduct line across the bottom of the reservoir basin was completed April 6, 1940, two shifts were being used commencing December 18, 1939, and three shifts January 15 to February 24, 1940. Excavation of ledge for the gate-house foundation was completed February 24 with a similar arrangement of shifts. The concrete substructure was completed early in May. The ledge from these excavations was used as riprap on the several dams. Steel framwork for the gatehouse superstructure was completed June 22, and the masonry walls of granite ashland exterior and tile interior on July 11, and the roof of precase slab and slate roofing about August 10. Installation of water piping, electrical work, emergency power unit, electric crane and other power equipment was practically complete August 22.

Four 30-foot sections of collapsible steel forms were used in constructing the twin aqueduct. The lower barrel was completed before the upper barrel was started. Concreting was commenced March 1, 1940, and completed May 3. A drain was constructed extending through the upper barrel in order to provide drainage during construction, and subsequently. This furnishes some obstruction to flow and can and should be removed at some future time whenever necessary to increase the carrying capacity of the aqueduct. Erection of the 8-foot fence and access gates was started June 28 and completed August 22. Uncompleted portions of the several dams where earthwork had been stopped for the winter were finished and the outer slopes loamed and seeded and the inner slopes riprapped. An access road was constructed to connect the gatehouse with Oak Street, Weston.

The final estimate dated May 13, 1941, was for $574,183.69. The contractor's force in 1940, averaged 59 men for 47 weeks, the maximum being 146 for the week ending March 30, 1940.

The total work done and materials furnished under the principal items of Contract 80 are as follows:

Clearing	67 acres
Stripping	82,690 cu. yds.
Earth excavation	218,810 “ “
Rock excavation	30,150 “ “
Consolidated pervious embankments	39,470 “ “
Rolled semi-impervious embankments	29,950 “ “
Rolled impervious embankments	45,560 “ “
Miscellaneous unconsolidated embankments	42,540 “ “
Crushed stone and screened gravel	4,850 “ “
Riprap	8,480 “ “
8-foot 6-inch twin line concrete conduit	1,057 lin. ft.
Miscellaneous concrete	3,470 cu. yds.
Reinforced concrete	2,180 cu. yds.
Portland cement	9,335 barrels
Stone masonry	127 cu. yds.
Permanent fencing	13,090 lin. ft.

The following subcontractors did substantial amounts of work under this contract.

Edward J. Baker Company	Fencing
Eagle Cornice & Skylight Works	Slate roofing and cooper work
Federal American Cement Tile Co.	Precast roof slabs
National Gunite Constr. Co.	Guniting and mortar lining
B. L. Whittemore	Electrical work
E. T Ryan Iron Works	Bronze windows and doors

Contract 81.—Contract 81, for constructing Section 6 of the cut-and-cover pressure aqueduct, was continued to completion. The death of Mr. Gaddis early in 1940 placed a severe handicap upon the contractor's organization and although an attempt was made to continue the work, satisfactory progress could not be secured and on November 21, 1940, the contract was declared defaulted and the work was taken over by the Employer's Liability Assurance Corp., the Surety on the contractor's performance bond.

Work under all items was carried on throughout the winter of 1940, steam being used to keep the ground thawed in advance of pipe laying. Concrete and stone work were protected by heating the aggregates and by using salamanders in canvas enclosures. The placing of the 11-foot 6-inch steel-cylinder reinforced concrete pipe in sections 16 feet long and weighing from 40 to 50 tons was continued by the method previously described, with two cranes operating close to the edge of the trench. The laying of the 11-foot 6-inch pipe was completed May 14, and of the 7-foot pipe July 8, the respective total lengths being 15,225 and 2,203 feet. The inside mortar joints of the larger pipe were, with few exceptions, placed by the gunite method and steel-trowelled for finish, and those of the smaller pipe were placed by hand.

The connection between the 7-foot line and the existing supply mains from the Weston Aqueduct line were made between September 3 and 27, following which the 7-foot line was immediately put into service as part of the distribution system. Leakage tests of the temporary bulkhead at the end of the line next to the Charles River Shaft were satisfactorily completed and the work accepted January 31, 1941.

The final estimate dated March 13, 1941, was for $615,154.67.

Additions to the contractor's plant included three caterpillar-tractor bulldozers, miscellaneous trucks, air compressors, pumps, etc.

The total work done and materials furnished under the principal items of Contract 81 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract.

American Chain Link Fence Co.	Fencing
National Gunite Contracting Co.	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works	Plate steel pipe connections

Contract 89.—Contract 89, for constructing mortar lining in the old steel pipe siphons of the Weston Aqueduct, was continued to completion in 1940. Just before the close of the previous year the contractor had cut six access holes in the 90-inch steel pipe of the Sudbury River Siphon. Cleaning of the inside of the steel pipe started at the east end, at Chamber No. 2, and proceeded westerly to Chamber No. 1 by using a ⅛-inch water jet under 900-pounds pressure,

supplemented where necessary by wire brushes and steel scrapers. Cleaning the Sudbury River Siphon was completed December 21, 1939, and the cleaning of the Happy Hollow Siphon was then started and completed December 29. The average force engaged in cleaning and removal of waste was 16 men. The ⅜-inch mortar lining was placed by machine which projected the mortar centrifugally at high velocity, the revolving head operating at the axis of the pipe, the machine operated by electric power progressing along the pipe ahead of the lining at a controlled rate of speed, varied to fit the requirements. The mortar was fed by a short screw-feed conveyor into the distributing head, thence through fixed ports from which it was picked up by vanes rotating at 1,000 revolutions per minute and thrown against the pipe wall. A set of slowly revolving trowels smoothed and finished the lining after placing. A batch of the mortar consisted of 270 pounds of dry fine beach sand, three sacks of Portland Cement and 10 gallons of water mixed outside the pipe and delivered to the buggy in the pipe at one of the access openings. After the passage of the machine it was necessary to smooth up around the rivit heads in the circumferential joints partly by hand with steel trowels and partly with a smaller coating machine. The 3,622 feet of Sudbury River Siphon was lined January 3 to 20, 1940, and the 1,141 feet of Happy Hollow Siphon January 22 to 26, 1940. The total length, which included 12,335 square yards, was placed in 126 hours actual working time at the average rate of about 38 linear feet, or 98 square yards, per hour. The rate of travel of the machine varied from 23 to 60 feet per hour, and the force employed in the lining operations from 43 to 53 men. The curing of lining was completed February 28, 1940. All work, including testing the pipe, erecting about 16,350 feet of fence, miscellaneous repairs in the four existing siphon chambers and sand blasting and painting the exterior of the existing pipe arch over the Sudbury Reservoir, was practically completed March 8, 1940.

The final estimate dated June 28, 1940, was for $42,940.85. The contractor's force in 1940 averaged 14 men, the maximum being 48 for the week ending January 13, 1940.

The principal items of plant were as follows:
One large and one small coating machine.
One air-operated and two battery-operated motor buggies.
Three 1-cu. yd. gasoline-driven mixers.
Other miscellaneous equipment.

The total work done and materials furnished under the principal items of Contract were as follows:

Cleaning the old steel pipe	12,580 sq. yds.
Mortar lining	12,450 sq. yds.
Permanent fencing	16,340 lin. ft.

Important work was done under this contract by the Centriline Corporation, subcontractor for mortar lining.

Contract 96.—Contract 96, for constructing the chlorine storage house and appurtenances and furnishing and installing emergency equipment at Norumbega Reservoir, was started in April, 1940. The storage building is located about 230 feet southeasterly from the Norumbega gatehouse and the work included the laying of pipes for water, chlorine, ammonia and steam heat and wires for electric power and control in two concrete conduits between the two buildings. Work began with clearing the site and excavating the foundations. The first concrete was placed April 26. The concrete in the building was completed June 4, and the concrete conduits with removable precast covers August 7. Electric wiring, plumbing, heating generating and roofing was started late in April. A room partitioned off with a glass block wall was constructed August 13 at the Norumbega gatehouse to house the emergency chlorine and ammonia apparatus which was completely installed October 19, 1940. The contract was completed early in 1941, when satisfactory tests of the chlorine euipment were made

The final estimate dated May 31, 1941, was for $54, 795. 38. The contractor's force averaged 7 men, the maximum being 13 for the weeks ending May 18 and June 15, 1940.

Contract 129.—Contract 129, for constructing drainage pipe in the Town of Weston, was started March 24 and completed March 29, 1941. This drain crosses over the pressure aqueduct at a point just west of Park Road and was required under the terms of a real estate agreement.

The final estimate dated June 30, 1941, was for $475.00. The contractor's force averaged 7 men.

SOUTHBOROUGH-FRAMINGHAM DIVISION—CITY TUNNEL DIVISION

The Southborough-Framingham Division until October 18, 1940, and thereafter the City Tunnel Division, continued in charge of the field work in connection with Sections 1, 2 and 3, the westerly half of the pressure aqueduct, and of their construction, and was in charge of the construction of the Charles River Shaft and of the field work in connection with the proposed City Tunnel for distribution east of this shaft. On May 1, 1941 this division took over the maintenance of the entire aqueduct line and Norumbega Reservoir. All work west of Sudbury Reservoir was done in cooperation with the Clinton Office of the Water Division of the Metropolitan District Commission, Harold J. Toole, Superintendent, succeeding E. R. B. Allardice, retired. All work in the vicinity of Sudbury Reservoir and easterly to the Charles River was done in cooperation with the Framingham office of said division, Israel P. Aubey, Superintendent. The City Tunnel Division was discontinued as a separate field division on August 10, 1942, and thereafter the office in Auburndale was continued as a branch office under the single Reservoir and Aqueduct Division.

MISCELLANEOUS OFFICE WORK

Periodical and final estimates were prepared for Contracts 74, 75, 77, 84, 94, 100, 110, 114, 127 and 130. Miscellaneous plans prepared included topography at the various shaft heads, profile of the proposed City Tunnel to include three possible additional shaft sites and miscellaneous real estate plans. Land taking plans were prepared covering property at the shaft heads and easements required to be taken from the Boston & Albany Railroad. Work was in progress on record plans of the pressure aqueduct. Plans were prepared in cooperation with the Town of Weston covering the town's crossing of the pressure aqueduct at Park Road with its new 12-inch steel main.

MISCELLANEOUS FIELD WORK

Lines and grades were given for Contracts 74, 75, 77, 84, 94, 110, 114 and 130. Surveys were made of miscellaneous properties along the pressure aqueduct line and for the location of bore holes and for profiles along the line of the proposed City Tunnel. Surveys of the revised location of the City Tunnel and topographic surveys of spoil areas at the three additional shaft sites were made. Topographic surveys for drainage were made in connection with the settlement of damages to real estate adjoining Norumbega Reservoir. Surveys were continued along the pressure aqueduct for use in preparing record plans. Surveys were made and test pits dug for information to be used in the design of the Nut Island sewage treatment plant. Miscellaneous photographs of real estate and construction work were taken, and many enlargements were prepared for use in litigation.

Miscellaneous aggregate and concrete samples were taken during construction operations for purposes of testing. Geological studies were continued, including detailed mapping of the Southborough Tunnel and of the Charles River Shaft and the examination of this shaft as the excavation progressed. They also included seismograph investigations in certain areas along the north loop of the proposed City Tunnel where seismic profiles of the depth of overburden in certain critical areas were taken with the cooperation of Reverend Daniel Linehan of Weston College. These profiles were made to assist the sub-surface investigations by core borings under Contract 113, but were found somewhat unreliable due in a large part to sudden changes in sub-surface terrain, and to the presence of decomposed rock overlying the sound bedrock.

The work of maintenance along the pressure aqueduct included setting stone bounds, planting shrubbery received from the Belchertown nursery, and grouting with bentonite the foundations under one of the low embankments of Norumbega Reservoir. Repairs were made of various properties of the Commission used for storage purposes.

An average force of 7 men was employed for 6 weeks in 1941 on work under the Federal grant. On other miscellaneous work a small labor force was employed a portion of each year.

PROGRESS OF CONTRACTS

Contract 74.—Contract 74, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct, was substantially completed July 15, 1940, and all work was completed under the contract September 25. The contractor's machine shop at Shaft 2 was destroyed by fire January 12, 1940, and immediately rebuilt. The contractor continued to obtain his electrical power from the District's Sudbury Dam power station until September 15. The total power consumption at Shafts 1, 2 and 3 for the year was 1,574,800 kilowatt hours, and at Shaft 4, 336,000 kilowatt hours, the total for the duration of the contract being 3,134,800 kilowatt hours at Shafts 1, 2 and 3, and 819,400 at Shaft 4. The contractor continued the use of sewage tanks at the shaft heads. At the completion of the work the tanks at Shaft 1, 2 and 3 were entirely emptied of their contents and filled with gravel and the 10,000 gallon tank at Shaft 4 was left for the use of the contractor on Contract 84. The tunnel excavation continued exceptionally dry. The work was remarkably free from serious accidents and there were no fatalities. Tunnel excavation continued by the full-face method, the additional length excavated from Shaft 1 was 241 feet, until December 17, 1939; 370 feet in the west heading from Shaft 2, until December 19. No additional tunnel support was required. The tunnel excavation was completed on December 19, 1939, when Commissioner Hultman threw the firing switch at the top of Shaft 2 for the last blast.

At the beginning of the year 1940, the surface plants at Shafts 2 and 3 of the concrete tunnel lining operations were under construction. Both plants were similar in design, each consisting of a line of 9 steam heated aggregate bins extending out from the shaft head and holding the fine aggregate and two sizes of coarse aggregate. These bins were filled by truck from the stock piles located at the shaft site. In an enclosed trap tunnel beneath the bins were three, 14-cubic-foot scale hoppers that travelled on overhead rails and emptied onto a belt conveyor running to the top of the shaft. From this conveyor the aggregate was emptied into a 10-inch pipe running down the shaft to an air operated gate by which the aggregate was dumped into 1-cubic-yard batch boxes on small flat cars.

Bulk cement was unloaded from freight cars at the Southborough depot siding into a cement hopper by an unloading screw-and-bucket conveyor. It was transported in covered trucks to a 2,000-barrel cement bin at each shaft. The cement was then moved by screw conveyor to a vertical 10-inch pipe, dropping to a small auxiliary hopper at the bottom of the shaft from which it was weighed and loaded into a separate compartment in the batch box. A train of 5 cars with 2 batches each was hauled to the 28-cubic-foot electrically-operated mixer, located about 100 feet from the forms. The concrete was discharged from the mixer into a pistonless air gun and shot through a 6-inch shooting line into the top of the form,

Collapsible circular forms were used in 20-foot sections with a row of 4 inspection ports spaced around the circumference every 5 feet in length. In general, 5 of these forms were assembled at a time for placing concrete. Two hundred feet of forms were used with each mixer so that the usual schedule of placement called for placing concrete starting at midnight and continuing until the 100-foot form was filled, usually at or before noon, cleaning the rock invert, moving the mixer, trimming and taking care of water, then moving the previously filled 100 feet of forms from 4 P. M. to midnight, ready for the next concreting. The forms were collapsed and telescoped by means of a form jumbo.

The mixer fed from the Shaft 3 plant started January 4, 1940, placing concrete near the bottom of Shaft 4 and continuing back toward Shaft 3 until the shaft was reached March 25, the average daily progress being 58 feet. Here the mixer and the form jumbo were turned around and started again about two thirds the distance from Shaft 3 to Shaft 2 on April 2, working back towards Shaft 3, and completed on June 7, with an average daily progress in this stretch of 61 feet. The total distance concreted by this plant was 8,869 feet. The mixer fed from Shaft 2 was similarly operated commencing to concrete first near the bottom of Shaft 1 on February 12, and completed the run to Shaft 2 April 26, with an average daily progress of 72 feet, and then started the final run May 6, and completed June 22, with an average daily progress of 35 feet. The total distance concreted by this plant was 6,989 feet. After the tunnel lining was brought as close to the shafts as possible, about 110 feet, the mixer was brought to the surface and concrete mixed there and lowered into the tunnel, epecial forms being required for the closure on to the shaft lining previous placed.

The special section at the bottom and top of the downtake shaft, shaft 1, were completed March 12 and May 29, respectively, with transit-mixed concrete. Special work at the unwatering shaft, Shaft 4, was started May 10 with placing of steel lining in the pump chamber in the bottom of the shaft. The work in this shaft was carried on continuously, the shaft concrete following the steel lining. Wooden forms were used in the uptake shaft in the dry well with special forms for the Venturi meter section. All work in this shaft was completed September 18, 1940. Special features at the top of Shaft 3, consisting of a spillway into Sudbury Reservoir and provision for future water supply connections, was started July 15 and completed September 21.

Grouting of the tunnel was carried out in two operations commencing after the concrete was allowed a 28-day moist curing. First the tunnel was completely grouted under low pressure during which a maximum pressure of 50 pounds per square inch was used until each connection was filled to refusal. A compressed air pressure grouting maching mounted on a rubber-tired truck was towed through the tunnel by an electric battery tractor. The mixture used in grouting depended upon the known condition of the rock and the reaction observed at each connection and varied from a neat mixture of 1 cubic foot of cement and 30 gallons of water to a mixture which included sand in the proportion of 3 sand and 1 cement. For the high pressure grouting 1 cubic foot of cement to 40 gallons of water was generally used, the maximum pressure being 350 pounds per square inch. Grouting was completed September 9, and leakage in the entire length, 3 miles, was reduced to approximately 28 gallons per minute.

The final estimate dated September 27, 1940, was for $2,933,832.49. The contractor's force in 1940, averaged 258 men, the maximum being 389 for the week ending May 29, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal items of Contract 74 were as follows:

Earth excavation in shafts	730	cu. yds.
Rock excavation in shafts and in tunnel within 50 feet of shaft	10,375	" "
Excavation in tunnel except within 50 feet of shaft	142,500	" "
Pumping from shafts and tunnels	54,580	mil. ft. gals.
Drainage channels for shafts and tunnel	16,635	lin. ft.
Concrete masonry for shafts	3,705	cu. yds.
Concrete masonry in tunnel	57,150	cu. yds.
Other concrete masonry	1,700	cu. yds.
Steel linings for Shaft 4	206,900	lbs.
Steel support in tunnel	237,530	lbs.
Timbering in shafts and tunnel	159	M ft. B. M.
Mixing and placing grout	10,390	cu. yds.
Portland cement	120,100	bbls.
Refilling and embanking	31,660	cu. yds.

Contract 75.—Contract 75, for constructing Section 1 of the cut-and-cover pressure aqueduct, was continued to completion. The placing of the 12-foot 6-inch diameter steel-cylinder reinforced concrete pipe in sections 12 feet long

and weighing approximately 46 tons each, continued by the method previously described, with a locomotive crane in the trench. A total of 123 sections, or 1,445 feet, were laid during 1940, making a total of 800 sections, or 9,564 feet Excavation was completed February 1, 1940. The last section of pipe was delivered March 22, and the last section placed June 14, after the removal of the tracks for the locomotive crane. The last few sections of pipe were placed at the easterly end by rolling the pipe down a ramp adjacent to Shaft 1 of the Southborough Tunnel on to greased skids set on rails on the concrete base and sliding it westerly to the pipe previously placed. The average number of sections placed, on each day on which pipe was actually placed, was 4. The maximum in any one day was 10. Refill over the aqueduct was completed August 16, and loam dressing October 2. Final caulking and placing mortar on the inside joints was completed June 27.

At the pressure aqueduct intake works the construction work for diverting crane brook was resumed in June, 1940, and completed July 15. The reconstruction of the open channel above the intake works to form an equalizing basin was continued by raising the embankments and the road on the north side of the basin during June and July, and stripping and regravelling the slopes to the increased height. The construction of the masonry diversion dam was continued to completion on February 6, 1940. The concrete substructure of the intake building was completed September 21, and work on the superstructure suspended during the winter. The building was of stone masonry exterior and tile interior. Steel frame and slate roofing was completed June 12 The special steel plate connection from the intake to the aqueduct contained provisions for future extension of the pressure aqueduct line to Wachusett Reservoir and was completed June 21, and the special connection with similar provision at the downtake shaft of the Southborough Tunnel, Shaft 1, was completed August 14. Permanent fencing along the aqueduct consisting of approximately 23,300 feet was started May 14 and completed October 3, 1940.

The test for leakage was made between temporary dished steel bulkheads at the two ends of Section 1. Very satisfactory results were obtained; namely, 7.1 gallons per day per inch of interior pipe diameter per mile of pipe at low working hydrostatic head.

The final estimate dated January 29, 1941, was for $521,806.66. The contractor's force in 1940, averaged 49 men, the maximum being 159 for the week ending June 8, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal item of Contract 75 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract:

American Chain Link Fence Co.	Fencing
Pneumatic Concrete Corporation	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works	Plate steel pipe connections

Contract 77.—Contract 77, for constructing Section 3 of the cut-and-cover pressure aqueduct, was continued to completion. The work was continuous except for the period from February 15 to March 23, 1940, when all operations were suspended. It was accepted as substantially complete on September 15 and all work was completed under the contract November 30, 1940. The placing of the 11-foot 6-inch diameter steel-cylinder reinforced concrete pipe in sections 16 feet long and weighing from 40 to 50 tons each, continued by the method previously described, with a gantry crane astride the trench. A total of 123 sections, or 1,445 feet, were laid during 1940, making a total of 800 sections, or 9,564 feet. Excavation was completed February 1. The last section of pipe was put in place January 4. Backfill was completed May 11 and final caulking and mortaring of the joints June 4. Loam dressing, seeding and grassing was completed July 17.

The connection to the existing supply lines of the Weston Aqueduct was started April 16, 1940, by unwatering two of them, lines Nos. 2 and 3 and diverting the entire supply through No. 1. Of the 60-inch cast-iron pipe removed from lines 2 and 3, 12 lengths were sent to Stoneham and used in the construction of the enlargement to Fells Reservoir under Contract 99. The 84-inch steel-cylinder reinforced concrete pipe comprising the main connection from the new pressure aqueduct to the Weston Aqueduct was placed June 27 and final caulking completed July 19. All the necessary changes in lines 2 and 3 including the special steel plate connections to the 84-inch line were completed October 9 and the water then shut off from line 1 and diverted through the reconstructed lines 2 and 3, behind a temporary bulkhead in the connection to line 1 and to the pressure aqueduct. Work then proceeded on the removal of cast-iron pipe sections in the old line 1, and the construction of special steel plate connections and valves at this point. Some cleaning up and minor work remained to be done at the end of 1940, and the reconstructed line 1 had not yet been put back into service. Work on the special steel plate connections to the uptake shaft of Southborough Tunnel, Shaft 4, was commenced on July 13, 1940, and the six 72-inch main control valves were placed during the next two weeks. Fencing along the aqueduct, consisting of approximately 35,000 feet was started April 16 and completed September 27.

The test for leakage was made between temporary dished steel bulkheads at the two ends of Section 3. Very satisfactory results were obtained, namely, 12.2 gallons per day per inch of interior pipe diameter per mile of pipe at full working hydrostatic head.

The final estimate dated January 29, 1941, was for $496,597.43. The contractor's force in 1940, averaged 44 men, the maximum being 171 for the week ending May 18, 1940.

No important items of plant were added.

The total work done and materials furnished under the principal items of Contract 77 are shown in an accompanying table.

The following subcontractors did substantial amounts of work under this contract.

American Chain Link Fence Co.	Fencing
Pneumatic Concrete Corporation	Guniting and mortar lining
Walsh Holyoke Steam Boiler Works	Plate steel pipe connections

Contract 84.—Contract 84, for constructing the head house and appurtenances at Shaft 4 of the Southborough Tunnel, was started September 19, 1940. The work consisted of constructing a masonry building on foundations most of which were placed under Contracts 74 and 77. The erection of structural steel was started November 19, and practically completed during the first season. The stone masonry was started November 22 and protected during the cold weather by closing the building with tarpaulin and heating with salamanders until the setting was completed January 18, 1941. Interior brick and tile masonry was set along with the outer stone masonry, lagging behind in general about 1½ stone courses. The roof purlins were covered with wire mesh for subsequent guniting and the precast roof slabs placed February 7. The copper roofing was completed May 1. The inside roof members were gunited and the rebound cleaned up March 21. The electrical work included wiring in the dry shaft and underground pump chamber for tunnel unwatering. This work was completed and the switchboard tested May 12. A temporary power connection from the generating plant on the Sudbury Dam was made April 10 and removed July 16, 1941.

The work of installing the tunnel unwatering pump at the bottom of the shaft commenced April 17 and was completed June 2. The entire work, including the adjustment of Venturi meter recording panels for the large meter on the by-pass to Weston Aqueduct, special valve mechanisms, air blower for ventilating the unwatering pump chamber, grading of the grounds and construction of display fountain, was completed September 26, 1941.

The final estimate dated October 1, 1941, was for $100,673.01. The contractor's force averaged generally 10 to 12 men.

Contract 94.—Contract 94, for sinking a caisson to sound ledge for the Charles River Shaft, No. 5, of the pressure aqueduct, was started in Feburary, 1940. The work consisted of sinking from the bottom of a shallow open cut close to the Charles River a reinforced concrete caisson 43 by 20 feet to sound ledge, and constructing near the top of the shaft, connections to the east end of the pressure aqueduct built under Contract 81. The caisson contained three large wells. The central well was 12 feet in diameter inside the steel lining and will later form the 9-foot diameter dry well for access to the tunnel unwatering pump chamber at the bottom of the shaft. The two outer wells were 9 feet 8 inches in diameter inside the steel linings, which linings will later be extended for a suitable bond the sound ledge and these wells will later form the two 9-foot diameter downtake shafts, one to the Chestnut Hill branch and the other to the northerly branch of a possible future distribution City Tunnel loop. The contractor started assembling his equipment February 9, cleared the site and started open-cut excavation February 12. About 150 gallons per minute were pumped from lines of well points sunk from the original surface and from a berm, and about 400 gallons per minute from a gravel-packed deep well sunk about 47 feet. A foot of screened gravel was placed on the bottom of the open cut for a bearing surface for the caisson shoe, which was set March 23 at Elev. 32. The first 7-foot lift of concrete was completed April 9. Excavation in the caisson was started April 11 by means of men loading a clamshell bucket and was continued by this method to Elev. 10.5, where on April 28 the incoming water was more than the pumps could handle in spite of additional well points driven in the working chamber floor. The contractor then decided to install air. While the compressed air plant was being installed excavation was continued with a clamshell bucket digging under water until Elev. 11 was reached May 21, the excavation being interrupted from time to time for the pouring of additional concrete lifts.

The first shift under air commenced work May 31, 1940, under a pressure of 15 pounds per square inch. The maximum pressure reached when ledge was encountered was 29 pounds. Air was discontinued June 19, after the caisson had been sealed off with the shoe at Elev.—35.50. Open excavation in bedrock continued to Elev. -80.5 on July 2. After trimming and scaling and placing of timber at danger points in the shaft sides, the pouring of concrete lining in the excavated shaft started July 10 and continued until the closure was made to the bottom of the caisson September 4. On July 25, excavation in the shaft was resumed and continued to Elev. -104.5, which was reached August 2.

During the caisson-sinking operations in open air, the contractor averaged 2.16 feet per day, the maximum being 5.36. During the caisson sinking under air the average progress was 2.38 feet per day, the maximum being 3.0. During the shaft extension into rock below the caisson in open air, the average progress was 3.04 feet per day and steel and concrete lining in the three wells was placed at an average rate of two feet per day. Grouting in the shaft was carried on continuously from September 18 to 26, starting in the lower connections and progressing upward, using a mix of 1½ bags of cement to 50 gallons of water.

Concrete foundation mats for the control valves and aqueduct connections at the top of the shaft were placed during August. The placing, assembling and welding of valves and steel plate work was completed October 5, and the concrete envelope and mortar lining October 23. Connections to the end of the pressure aqueduct line constructed under Contract 81 are located north of the shaft, and those to a possible future second line are on the south side of the shaft. All work was completed October 28, 1940.

In order to provide for future work at the site, including the future tunnel contract, with a minimum of interference and also in order to reduce liability of damage to the equipment, one of the 60-inch valves nearest the shaft head was removed and a temporary blank flange was substituted The bonnet and disc were removed from two other valves, and the fourth valve which was in such a position that it did not materially interfere with the shaft head frames was protected by heavy timbering.

The final estimate dated February 7, 1941, was for $190,396.32. The contractor's force averaged 24 men, the maximum being 74 for the week ending June 8, 1940.

The principal items of plant were as follows:

1 Hoist
3 Cranes—65, 45 and 30-foot booms and clamshellbuckets
1 60-horsepower Diesel crane, 60-foot boom
1 Caterpillar-tractor bulldozer
Miscellaneous pumps, compressors, trucks, concrete mixer, etc.

The total work done and materials furnished under the principal items of Contract 94 were as follows:

Construction of shaft down to Elev. –50	
Earth excavation	2,600 cu. yds.
Rock excavation	300 cu. yds.
Concrete	2,025 cu. yds.
Reinforced steel	148,000 lbs.
Steel pipe	143,000 lbs.
Shaft excavation below Elev. –50	
Excavation	1,390 cu. yds.
Concrete	450 cu. yds.
Steel plate lining	52,630 lbs
Steel plate pipe outside limits of shaft	82,600 lbs.
Concrete outside limits of shaft	975 cu. yds.
Portland cement other than for shaft above Elev. –50	2,190 bbls.
Reinforcing steel other than for shaft above Elev. –50	119,560 lbs.
Caring for and setting valves furnished by Commission	149,620 lbs.

Contract 110.—Work under Contract 110, for extending the Charles River shaft of the Pressure Aqueduct, consisted of continuing the excavation of the shaft to its full depth below the limit reached under Contract 94, constructing the preliminary lining of the three walls and excavating for the future pump chamber and tunnel headings at the bottom of the shaft. Under the terms of the contract, it was necessary for the contractor to use two head frames. Erection of these was started September 28, 1940, and completed October 21. Actual rock excavation in the shaft started October 23 and was interrupted by a strike from November 20 to 29. The method of excavation was to drill the rock, each round having 40 holes about 8 feet deep, load, shoot and muck by hand into 1¼-cubic yard buckets which were dumped at the top into trucks which hauled the muck to the spoil area. Due to delay in the delivery of steel plate interlining, it was impossible to concrete the lining as the excavation progressed so that temporary timber support was required. The entire depth of the shaft from Elev. -80, the limit of the concrete lining placed under contract 94, was supported with timber. Due to delays in the delivery of steel lining, it was not possible to replace the concrete lining as the excavation progressed. In order not to unduly delay the prosecution of the work, the excavation was continued to the bottom of the shaft and the steel and concrete lining placed from the bottom up. The potential hazard in such a depth of unsupporting shaft necessitated the placing of temporary timber support for the entire depth. The excavation and timbering continued until January 4, 1941, when an elevation of -279 was reached, a few feet below the bottom of the lining under this contract. Preparations were immediately made to start placing the concrete. Forms were set for the two future waterway shafts, which have no steel lining at the bottom. Bituminous-lined and galvanized pipes to be encased in the concrete for various requirements of the contract and steel lining of the central future dry well were set in place and provisions made for controlling the leakage of water. The first concrete was placed January 19. Transit-mixed concrete was used. Temporary timber support was removed as the work progressed up the shaft. After the first 44 feet of concrete lining were completed, excavation was resumed at the bottom of the shaft and extended into the future underground pump chamber and the two tunnel headings required for the future distribution tunnel loop. The placing of concrete in the shaft and excavation at the bottom were then carried on simultaneously, except that excavation was suspended temporarily during the actual pouring of concrete. The tunnel heading to the northeast was turned March 4, and to the east toward Chestnut Hill April 1. The connection of the steel linings and embedded pipes to the existing linings

previously built at Elev. -80 was made and the final concrete placed May 31, previous to which all excavation in the heading at the bottom of the shaft stopped and was not renewed. Excavation in the northeast heading had progressed about 115 feet, and in the easterly branch to Chestnut Hill about 206 feet, the tunnel invert at these locations being Elev. -312.5. In order to support the excavation in the underground pump chamber during the period which will ensue before resumption of work under a future contract, timber support was placed during the week ending June 7. Pumping from the shaft was then stopped, the head frame and all other buildings and structures at the site removed, and a cover built over the top of the shaft, all of which was completed June 21, 1941.

The final estimate dated July 10, 1941, was for $205,194.97. The contractor's force averaged 56 men, the maximum being 92 during the week ending December 14, 1940.

The contractor used two 5-ton hoists, one 10-ton crane, one caterpillar tractor bulldozer, two 500 c.f.m. compressors, and 40-foot steel forms of 9-foot diameter, in addition to miscellaneous pumps, trucks, small tools, etc.

The total work done and materials furnished under the principal items of Contract 110 are as follows:

Excavation for shaft and tunnel	7,440 cu. yds.
Concrete masonry	2,700 cu. yds.
Timbering	137 M.ft. B.M.
Portland cement	4,460 barrels
Steel plate lining	257,490 lbs.
16″ to 24″ bituminous lined steel pipe	780 lin. ft.

Contract 114.—Work under Contract 114, for making core borings for subsurface investigations at additional shaft sites on the line of the proposed City Tunnel, was commenced August 27, and completed December 3, 1942. 524 feet of core borings were made. The contractor used a maximum of six and a minimum of two men.

The final estimate dated December 3, 1942, was for $3,707.42.

Contract 127.—Work under Contract 127, for furnishing and installing switchboard equipment in the District's power plant at Sudbury Dam, was started December 9, 1941. In addition to installing a switchboard, a cable was laid from the pressure aqueduct control building to the Weston Aqueduct head house. The work was completed January 6. The contractor used an average of two men.

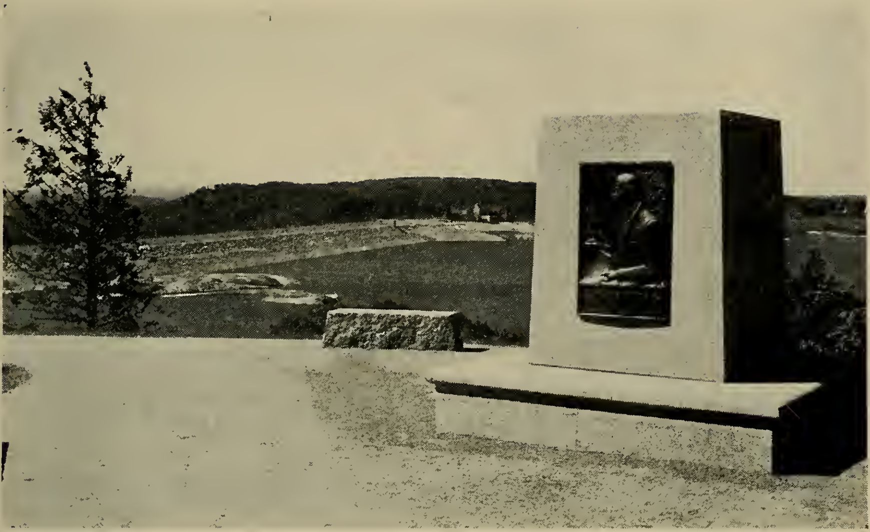
The final estimate dated March 22, 1942, was for $2,405.00.

Contract 130, for grading, loaming and grassing in the vicinity of Shaft 4 of the pressure aqueduct, and for the improvement of access roads in the towns of Marlborough, Southborough, and Weston, was started May 5, 1941, with the preparation of the surface of the access road to the pressure aueduct intake works and of the access road to Norumbega Reservoir, and with excavation in the vicinity of Shaft 4. Work progressed simultaneously at the three locations. Loam for dressing in the vicinity of Shaft 4 was hauled from the Commission's stock pile in Framingham. The two access roads were completed May 14, and the grading, loaming and seeding at Shaft 4, May 20. The work of the contract was considerably increased by the requirements of loaming in the vicinity of the Norumbega Reservoir gatehouse where an additional 1200 cubic yards were hauled and spread. All work under the contract was completed May 28, 1941.

The final estimate dated August 4, 1941, was for $9,999.00. The contractor's force averaged 23 men, the maximum being 31 for the week ending May 17. The contractor used one gas-driven shovel, two road graders, two 12-ton gas-driven rollers, two bulldozers and eleven 1½ to 5-ton trucks.

RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division continued until August 10, 1942, in charge of the work in the Quabbin Reservoir area, including topographic and real estate surveys, cemetery removals and reforestation, of all work in the Ware River watershed and along the Quabbin Aqueduct, of improvements in the Wachusett watershed, and of the construction, as WPA projects sponsored by



Winsor Memorial, Overlooking Winsor Dam from the Quabbin Hill Road

Quabbin Reservoir, Looking Northerly from the Administration Building

Quantities Involved in Contracts for Laying the Pressure Aqueduct Surface Pipe

Contract Number		75	77	78	79	81
Aqueduct Section Number (Section 2 is in tunnel Contract 74)		1	3	4	5	6
Diameter of Pipe		12'-6"	11'-6" 7'-0"	11'-6"	11'-6"	11'-6" 7'-0"
	Unit					
Gross Length of Pressure Aqueduct Including Valves and Steel Plate Specials	Lin. ft.	9,665*	16,565**	17,800	18,000	15,270***
Gross Length of Branch Lines Including Valves and Steel Plate Specials	Lin. ft.		120			2,305
Total Work Done and Materials Furnished Under Principal Items of Contracts						
Stripping	Cu. Yd.	25,115	32,020	36,750	35,860	39,430
Earth Excavation	" "	209,380	208,940	356,553	228,400	212,610
Rock Excavation	" "	15,500	13,940	3,080	9,830	31,430
Refill and embankment	" "	156,740	203,340	290,930	520,040	215,890
Soil Dressing	" "	22,440	44,020	43,080	52,320	38,260
Crushed Stone and Screened Gravel	" "	4,370	2,130	3,010	4,240	3,390
Caring For and Laying 12'-6" Precast Concrete Pipe Furnished by the Commission	Lin. Ft.	9,565	—	—	—	—
Caring For and Laying 11'-6" Precast Concrete Pipe Furnished by the Commission	Lin. Ft.	—	16,525	17,830	18,000	15,225
Caring For and Laying 7'-0" Precast Concrete Pipe Furnished by the Commission	Lin. Ft.	—	75	—	—	2,205
Concrete Foundations and Anchorages for Pipe	Cu. Yd.	9,935	9,550	10,620	11,990	14,750
Reinforced and Miscellaneous Concrete	" "	1,525	2,020	625	615	845
Reinforcing Steel	Pound	196,580	163,300	79,160	115,020	265,140
Portland Cement	Barrel	19,080	17,790	15,910	17,590	23,300
Steel Plate Pipe and Specials	Pound	65,810	103,200	6,205	8,465	97,560
Structural Steel	Pound	66,210	78,040	12,370	50,110	64,110
Stone Masonry	Cu. Yd.	183	81	65	57	69
Permanent Fencing, Type "B"	Lin. Ft.	32,530	35,380	53,290	51,210	13,690

* Does not include 15 ft. of Surface Conduit in Contract 74 for Tunnel under Sudbury Reservoir.

** Does not include 19 ft. of Surface Conduit in Contract 74 for Tunnel under Sudbury Reservoif.

*** Does not include 1306 ft. Twin Conduit, etc., through Norumbega Reservoir in Contract 80, nor 40 ft. of Surface Conduit in Contract for Charles River Tunnel Shaft.

the Commission, of sewer systems for the towns of Rutland and Holden. Commencing August 10, 1942, a single field division, the Reservoir and Aqueduct Division, took over supervision of all field work with two branch offices, one at the Ware River intake works covering work in the Ware watershed and on the Quabbin Aqueduct and one at Auburndale covering work on the Hultman Aqueduct and the City Tunnel and all field work in the Metropolitan area, including that on sewerage projects. The division continued the maintenance of the Rutland-Holden Sewer, and the operation of the water analysis laboratory in Belchertown, the Ware River intake works in Coldbrook and the Wachusett outlet works in West Boylston. Upon the completion of construction, Quabbin Park Cemetery, and the supply section of Hultman Aqueduct, including Norumbega Reservoir, were maintained and operated.

The Metropolitan Police continued to be housed in the Administration Building at Belchertown.

Miscellaneous Office Work

Periodical estimates for Contracts 52, 82, 93, 102, 106, 107, 108, 111, 112, 116, 118, 120, 124 and 125, and final estimates for Contracts 52, 66, 67, 72, 82, 93, 102, 106, 107, 108, 111, 112, 116, 118, 119, 120, 124 and 125 were prepared. Work was continued on revisions and additions to real estate plans. Rainfall, temperature and river flow records were kept at the established stations. Accompanying tables show the monthly rainfall during 1940 to 1945 inclusive, at stations on the Ware and Swift watersheds. Plans and studies were continued of methods of disposing of sewage in the towns of Boylston and West Boylston in the Wachusett watershed. Plans of the proposed general Ware taking were completed for the towns of Barre, Rutland and Hubbardston. Work was continued on the record plans of highways, structures and real estate holdings in the watersheds and along the aqueducts. Studies and plans were made for access roads in the reservoir area, for a transmission line to Quabbin Hill Building, for remodeling and constructing buildings for maintenance use at Quabbin Reservoir, including two new residences on Blue Meadow Road, and for altering property of the Commission near the south abutment of Wachusett Dam to provide for public toilets, housing of radio equipment and police maintenance. The Belchertown office continued its records of the affairs of the four former towns of Dana, Enfield, Greenwich and Prescott, issued vital statistics and records as requested, and investigated all cases of welfare and old age assistance.

Miscellaneous work was completed in connection with the Ludlow Manufacturing Associates' diversion damage case and assistance rendered to the Commission's attorneys during the trial of the case in Springfield.

Miscellaneous Field Work

Lines and grades were given for construction, and cross sections, profiles and other miscellaneous surveys were made in connection with work on Contracts 52, 66, 67, 82, 93, 106, 107, 108, 111, 112, 116, 118, 119, 120, 124 and 125, and with work on the WPA sewer projects in Holden and Rutland. Considerable topography was taken in connection with drainage studies in the Ware watershed, studies and designs for improving the access roads to Winsor Dam, and studies for the diversion of the sewage of West Boylston and Boylston in the Wachusett watershed. Field work in 1942 included surveying and inspecting the construction of approximately 16,250 feet of boundary fence north of Prescott peninsula, completed October 10, 1942, by the U. S. War Department, and miscellaneous surveys in other locations in the reservoir area while the Commission has permitted that department to use, also the surveying of lines for fences, fire lanes and clearing at the north end of the Prescott peninsula under a WPA program sponsored by the Federal government. Work was continued on the surveying of taking lines, of the relocated town liens, of areas in the reservoir bottom requiring reclearing ahead of the rising water level and of potential hazards to navigation as the water rises. The work of setting stone bounds to locate taking lines and outlying properties of the Commission was continued.

In 1941, weirs were installed on four brooks on the intervening drainage area between Winsor Dam and Bondsville. Stone suitable for the construction of the Quabbin Hill buildings were selected from roadside walls and hauled to the building site. Stone and other material for the work under Contract 118 were hauled to the various construction sites. Foundations for the pylons built under Contract 119 were constructed. Work was commenced in 1944 on the construction by force account of two residences on Blue Meadow Road for maintenance use at Quabbin Reservoir. Lumber and other materials were salvaged from various Commission-owned buildings on the watersheds for use in their construction. A sewer line was constructed to connect them to the main disposal line from the Administration buildings. The first of these two buildings was completed sufficiently to be ready for occupancy on November 6, 1945. One additional storage building was constructed in 1944 from one of the former C.C.C. camps on Route 9. The sewage disposal area at the Administration Building septic tank was extended in 1944. All vehicular repairs were taken care of at the repair shop in the west garage of the Administration Building and at the Ware River intake service building. Commencing June 17, 1940, the Quabbin Hill buildings were maintained for use of the public except for the period of the war emergency between December 9, 1941, and April 9, 1946.

Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct. The chlorinantor station on Mill Brook below the Central New England Sanatorium was maintained. The Department of Public Health continued its cooperation with this division in the analysis of samples of water. Surveys for the proposed City Tunnel extension of Hultman Aqueduct were continued. In 1945, real estate taking plans were prepared for the entire tunnel length.

Sewage level gages were maintained on the South Metropolitan sewer commencing in 1943, on the Neponset Valley sewer for a short period in 1944, at the Fens Gate Chamber of the Boston Marginal Conduit since June 23, 1944, and at the Charles River Dam Chamber of the Cambridge Marginal conduit since June 20, 1945. The field work included surveys and subsoil investigations for Sewerage Project No. 1 at Nut Island, soil analysis at the Park Road laboratory, the collection of flow data and the collection and analysis of sewage samples in the South Metropolitan trunk sewer, and the running of levels and the taking of flow data on Sewage Projects Nos. 4 and 5 on the Charles River Basin Marginal conduits. Work was continued on the reconstruction and equipment of the laboratory at Park Road.

Reforestation.—The general program of reforestation was continued with stock from the Commission's nurseries. In the spring of 1940, 100 pounds of white pine seed, 150 pounds of red pine and 25 pounds of white ash were planted; in the fall of 1940, 100 pounds of white pine seed; in the spring of 1941, 100 pounds of red pine and 10 pounds of hemlock. In addition, 25 bushels of hardwood tree seed were collected locally. Broad planting, including the percentage of survival to date, is summarized in the accompanying 6-year table.

Survival to date of the plantings in previous years, including replacements, is as follows:

1935	65%	1938	90%
1936	40%	1939 spring	75%
1937	90%	1939 fall	60%

The summary of stock in the nursery on June 30, 1945, in addition to about 1,000 miscellaneous trees and shrubs, is as follows:

Five-year seedlings (5-0)	1,900,000
Six-year seedlings (6-0)	1,900,000
Seven-year seedlings (7-0)	2,000
Five-year transplants (3-2)	85,250
Six-year transplants (2-4)	700,000
Seven-year transplants (2-5)	2,900,000
Nine-year transplants (2-2-5)	400
Total	7,487,650

Broad Planting Under the Program of Watershed Reforestation

Species	Type of Transplants	1940	1941	1942	1943	1944	1945
QUABBIN WATERSHED							
Nursery work		Apr. 16 to May 17	Apr. 9 to May 21	Apr. 2 to May 19	Apr. 12 to Sept. 30	Apr. 12 to July 15	Mar. 30 to May 15
Average Force		24 men	14 men	14 men	7 men	6 men	7 men
Broad Planting		Apr. 18 to June 6	Apr. 10 to May 29	Apr. 13 to May 25	Apr. 22 to June 11	Apr. 26 to June 7	Apr. 3 to May 23
Average Force		39 men	38 men	61 men	12 men	25 men	20 men
Acres Planted		965	1,260	1,200	300	500	425
Cost per M for planting		$9.00	$7.06	$8.04	$8.11	$8.16	$9.65
Survival to date		90%	90%	90%	90%	80%	75%
White pine	4-year	442,625	381,500	349,600	182,775	135,025	166,225 sdlngs.
	5-year						103,300
Red pine	4-year	522,675	379,725	670,000	150,425	610,000	370,225 5-yr.
Scotch pine	4-year	5,025					
White spruce	4-year	143,250		272,350			
	5-year			164,150			
Red spruce	4-year	22,000	270,275	70,000			
Norway spruce	4-year	68,575	57,050	10,525			
	5-year			150,725			
European larch	2-year	70,860	8,600	8,150 3-yr.			
	4-year	16,270					
Hemlock	4-year	33,900	5,750		41,900 5-yr.		
White ash	1-year		68,800				
Black walnut	1-year			520			
	2-year		800				
Sugar maple	1-year			12,250			
Hickory	1-year			7,900			
WARE WATERSHED							
White pine	4-year	255,000	80,000		75,000		50 5-yr.
Red pine	4-year	301,000	110,000		95,000		50 5-yr.
White spruce	4-year	200,000	25,000				
Red spruce	4-year	100,000	25,000				
Norway spruce	4-year	100,000					
European larch	2-year	100,000					
Hemlock	5-year				30,000		
Arbor Vitae					200		

On account of the difficulty in securing adequate labor, the work of reforestation was curtailed commencing in 1943, and a quantity of surplus stock sold.

Some work was done on gypsy moth control for 9 days in June, 1945, by roadside spraying on the Prescott Peninsula with arsenate of lead solution.

Landscape Planting.—The work of general landscaping was continued with local labor and for the most part with shrubs purchased from nursery stock or collected from local sources. It included the clearing of vistas and hurricane-felled timber along the Quabbin Hill Road, the release cutting of sprout growth in the pine plantations along the Daniel Shays Highway, and replacement and new planting and maintenance of trees and shrubs in the vicinity of the Administration Building, Winsor Dam, Quabbin Dike, Winsor Memorial and the entrance to Quabbin Park Cemetery.

WPA Clearing Project.—During 1941 a project was undertaken for reclearing reservoir areas ahead of the rising water level and for clearing fire lanes and hurricane felled timber on the watershed area, with labor furnished by the Federal Work Progress Administration and equipment furnished by the Commission. Work commenced March 21, 1941, with 24 men from Ware on clearing fire access roads and continued until May 14. Work was resumed April 25 with 9 men from Athol and 32 men, a few days later, from Warren, and continued until July 23, at which time the project was discontinued after about 100 acres of reservoir bottom had been recleared, and 2.4 miles of fire lanes and about 17 acres of hurricane debris cleared. The average force was 18 men, the maximum being 56 on April 29, 1941.

Floating Equipment.—The Commission has three engine-powered units, the 46-foot "Enfield", constructed under Contract 103 and launched April 17, 1941; the 26-foot "Greenwich", launched June 11, 1940, and the smaller 16-foot "Dana". These boats were continued in use for the transportation of workmen and equipment to various sections of the reservoir for taking water samples and general utility work.

Experimental Grazing.—On May 13, 1940, ten sheep were delivered from the Middlesex Fells Division of the Metropolitan District Commission and pastured below Quabbin Dike in experimental grazing areas. The flock now totals 50, on June 30, 1945. About 90 pounds of wool was sheared in 1941, 130 in 1942, 140 in 1943, 243 in 1944, and 286 in 1945.

Fire Protection.—Fire fighting equipment was maintained in readiness for service at all times, one fire truck being stationed at Pelham Hill, at or near the Reservoir Intake to Quabbin Aqueduct, one near the Ware River Intake Works, and the remainder of the fire fighting equipment at the Administration Building. During the six fiscal years, the equipment and personnel responded to calls for assistance at forest fires, mostly on property of the Commission, as follows:

	1940	1941	1942	1943	1944	1945
Quabbin Area						
Number of fires . . .	3	3	2	5	12	3
Acres burned . . .	78	—	152	107	1870	125
Ware Watershed						
Number of fires . . .	2	9	3	4	6	0
Acres burned . . .	20	725	156	9	284	—

Commencing in 1943 the U. S. Army bombing and gunnery range detachment with their fire fighting equipment was particularly effective in rendering aid. In May 1944, the army kept a considerable quantity of fire-fighting equipment in readiness at the Army boathouse on old Route 21.

Work was commenced in 1940, in mapping the location of future fire access roads. Local labor was employed in reclearing fire stops along the property taking line, burning hurricane timber and brush which had been previously cut and piled, clearing fire protection strips along access roads and along the Daniel Shays Highway, repairing abandoned roads to make them accessible for fire equipment, and constructing water holes. In cooperation with the weather bureau of the United States Department of Agriculture, a fire weather observation station was set up on Commission property and readings taken three times a day, April 8 to November 26, 1940.

Quabbin Park Cemetery.—The general removal of bodies from existing cemeteries in the reservoir area was continued to completion October 4, 1944. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. Those bodies not yet removed are buried in cemeteries some distance from the flow line and are accessible even though the roads in the area to be flooded are closed to travel. The work of cemetery removal is summarized in the following table, which shows a total of 7,561 bodies removed from the Quabbin Reservoir area.

Cemetery Removals

		During the last six Fiscal Years	Total to June 30 1945
Burial lots in Quabbin Park Cemetery assigned in exchange		4	707
Burial lots in Quabbin Park Cemetery sold		22	62
Number of releases executed of rights in old lots in Quabbin Reservoir area	to Q. P. Cemetery	8	705
	to other cemeteries	6	290
Bodies removed from Quabbin Reservoir area	to Q. P. Cemetery	404	6551
	to other cemeteries	24	1010
Bodies removed from area outside Quabbin Reservoir to Quabbin Park		2	6
Burials, not reinterments, in Quabbin Park Cemetery		127	279
Headstones moved	to Q. P. Cemetery	72	3399
	to other cemeteries	11	483
Monuments moved	to Q. P. Cemetery	5	372
	to other cemeteries	3	155

The vault was maintained for use, cemetery lots graded and seeded, the entire cemetery area properly maintained, and driveways plowed and kept clear of snow throughout the winter months. In 1945 the trees were sprayed by the cemetery force for gypsy moths and other pest control, not only in the cemetery itself, but also at the Administration Building and other important centers. Work of setting two new bronze tablets in the posts at the entrance to the cemetery was completed November 17, 1941. A small labor force was employed on cemetery work.

Rutland-Holden Sewer

New Meter Stations.—The meter station at the Rutland State Sanatorium was relocated in 1943, to serve the collecting system of the sanatorium as enlarged during the year by the Department of Public Health. An open-nozzle meter was put in operation in the new location on September 15. A meter station was constructed in 1943, in the trunk sewer at the point where it crosses the Rutland-Holden town line. This was necessitated by the new sewer system in the Town of Rutland and supplements the two stations which meter the discharge from the Rutland State Sanatorium and the U. S. Veterans' Hospital in Rutland. An open-nozzle meter was installed in the new station on September 20.

The Rutland-Holden sewer was in continuous operation. The entire length of the line and the meter stations at the Rutland State Sanatorium, at the U. S. Veterans' Hospital in Rutland and at the Holden-Worcester boundary line were inspected regularly, open-nozzle piezometer connections cleaned, records of flow maintained, and necessary repairs made.

Holden Sewer System.—Work was continued under the Commission's agreement with the Town of Holden for the construction of its system of sanitary sewers, in cooperation with the Federal Works Progress Administration and with the equipment furnished by the Commission as previously described. All lines and grades were given and the construction work superintended. At the request of the selectmen and sewer commissioners, studies and designs were made for the sewerage of a low area known as the Sunnyside area, to be substituted for the Salisbury Street area.

The average number of men employed on this WPA project in 1940 was 95 and the maximum 320. The total force available for work in Holden and Rutland was drastically reduced on May 14, 1941, at which time practically the entire force was assigned to Holden. A further cut in the WPA force and slow progress necessitated the hiring by the Commission of a power trench excavator and pipe layers on August 21, 1941. This ¾-cubic-yard trench hoe was used continuously 5 days a week after that date with a material increase in progress. In 1942, the average weekly WPA labor force was 35 men, the maximum being 97 during the week ending December 17, 1941. The Commission's labor force on this work in that year averaged 7 men. The Federal Works Progress Administration discontinued all work in the Worcester District on April 30, and no work was done on the Holden System by the WPA labor force after the week ending February 3, following which the Commission continued the Holden Sewer construction to completion with its own labor force.

In 1940, 8,615 linear feet of 8-inch sewer pipe and 529 feet of 10-inch sewer pipe were laid and 48 manholes constructed. The weekly average rate of laying was 176 feet and the maximum 736 feet. In 1941, 9,690 linear feet of 8-inch and 10-inch vitrified clay pipe and 456 feet of 10-inch cast iron pipe was laid, at an average rate of about 195 feet per week, the maximum being 540 feet for the week ending October 1, 1941. The average progress in 37.5 weeks by hand labor was 151.4 feet per week and during 14.5 weeks by hand labor with the trench hoe was 383.6 feet. A length of 996 linear feet or sheeted trench and 457 linear feet of 6-inch vitrified clay pipe underdrain was used to complete excavation and facilitate pipe laying. The sheeting was removed during backfilling operations. In 1942, 6,808 linear feet of 8-inch vitrified clay pipe was laid at an average rate of 315 feet per week for about 22 weeks, the maximum rate being 630 feet during the week ending January 7, 1942. There was also laid a total of 506 linear feet of 8-inch and 702 linear feet of 10-inch cast iron pipe, 91 feet of 6-inch underdrain, and 47 manholes. Timber sheeting was required for 1,500 linear feet of trench. Excavation for the Sunnyside Pumping Station was started June 13 1942, and the concrete poured between September 3 and October 27. In 1943, approximately 0.06 mile of sewer and one manhole was constructed, making a total of 5.61 miles and 134 manholes in the completed system. The Sunnyside Pumping Station was completed ready for operation in June. The average weekly WPA labor force prior to February 3 was 8 men, the maximum being 17 during the week ending December 5, 1942. The Commission's labor force averaged two men for 34 weeks. The system was accepted and put into operation by an agreement with the town, dated November 2, 1943.

Rutland Sewer System.—Work was begun April 26, 1940, under the Commission's agreement with the Town of Rutland for the construction of 16,200 ft. of sanitary sewers including 55 manholes, in cooperation with the Federal Works Progress Adminstration, and with the equipment furnished by the Commission. All lines and grades were given and the construction work superintended. In 1940, 4122 linear feet of 8-inch sewer pipe and 2,832 feet of 10-inch cast-iron pipe were laid and 14 manholes constructed. The weekly average rate of laying was 224 feet and the maximum 622 feet. The average number of men employed on this WPA project was 62 and the maximum 88. In the following year work was prosecuted principally from December, 1940, to May 14, 1941. 1,360 linear feet of 8-inch vitrified clay pipe were laid averaging about 20 feet per week, the maximum being 236 feet for the week ending January 29, 1941, and 3,922 feet of 10-inch cast-iron pipe were laid, the average rate being 227 feet per week and the maximum being 531 feet for the week ending March 26, 1941. Nineteen manholes were completed and 1,480 square feet of highway resurfaced. A length of 237 linear feet of sheeted trench and 247 linear feet of 6-inch vitrified clay pipe underdrain was used to complete excavation and facilitate pipe laying. The sheeting was removed during backfilling operations.

No WPA force was employed for the period from May 14 to November 8, 1941, except for occasional small cleanup and clearing crews due to a drastic cut in WPA forces. The average WPA force was 54 men during 37 working weeks. The maximum weekly force was 144 men during the week ending December 25, 1940. Work on this contract was resumed on November 8, 1941, when a small force of 14 men were available. In 1942, 5,971 linear feet of 8-inch vitrified clay pipe was laid at an average weekly rate of 153 feet per week for 39 weeks, the maximum being 517 feet during the week ending June 23, and 2,537 linear feet of 10-inch cast iron pipe at an average weekly rate of 284 feet per week for about 9 weeks, the maximum rate being 567 during the week ending June 3. 246 feet of 8-inch cast iron pipe were laid and seventeen manholes completed. No timber sheeting nor underdrain were required. The average weekly WPA labor force was 12 men, the maximum being 27 during the week ending January 28, 1942. The Commission's labor force on this work in 1942 averaged 4 men.

In 1943, approximately 0.33 mile of sewer and 17 manholes were constructed. The pipe laid during the year consisted of 1,850 linear feet of 8-inch and four feet of 10-inch vitrified clay pipe. The average weekly WPA labor force prior to the shut down April 30, was 10 men, the maximum being 19 during the week ending February 24. The Commission's labor force averaged six men for 50 weeks. No labor was furnished by the WPA after April 30. In 1944, approximately 0.11 mile of sewer and 1 manholes were constructed, making a total of 4.49 miles and 81 manholes in the completed system. The measuring station at the Rutland-Holden boundary line was completed, meter installed, and a continuous record kept commencing April 14. All construction work was completed September 21, and the entire line was cleaned, flushed and inspected. The pipe laid during the year consisted of 511 linear feet of 8-inch and 46 feet of 10-inch vitrified clay pipe. The Commission's labor force averaged about five men for 44 weeks.

Laboratories

Soil Testing Laboratory.—Tests of materials for embankment construction and acceptance tests on aggregates and other materials were continued in the former division office in the so-called Chandler house on January 16, 1940, when the laboratory was moved to the administration building in Belchertown. On September 16, 1940, the soil testing equipment which had been transferred to the Natick Laboratory was returned to the Administration Building. Sampling from the settle core was continued periodically through the ports of the observation wells in Winsor Dam and Quabbin Dike and material was tested for size gradation and porosity to determine the extent of consolidation. The wells were reinforced as required against buckling.

General assistance was rendered by the laboratory staff in connection with the damage suit brought by the Arthur A. Johnson Corporation and at the hearings for the damage suit brought by the Benjamin Foster Company. The work included opening about 50 test pits in borrow areas.

Spelter tests were made of zinc and other acceptance tests for the large quantity of fencing required along the pressure aqueduct and elsewhere.

The soil testing laboratory was discontinued December 20, 1941. In 1942 the equipment was moved to the building of the Commission in Weston, formerly the Samuel C. Bennett Estate, which has been equipped as a field laboratory for the dual purpose of studying and testing soils and of studying and analyzing sewage samples in connection with the sewerage projects in the metropolitan area.

Water Analysis Laboratory.—The taking and analyzing of samples from the Ware, Swift, Quaboag and Chicopee rivers was continued and general assistance was rendered by the laboratory staff in connection with the diversion damage suits brought by the Boston Duck Company, the Palmer Mills, Inc., and the Ludlow Mfg. Associates. The chemical and bacteriological analysis of the regularly scheduled samples from Quabbin Reservoir and tributary streams in the Swift and Ware watersheds was continued. Samples at the reservoir stations were taken generally at the bottom, top and at each even 10-foot depth.

Samples of drinking water supplies used by the United States Army were tested frequently as requested. Commencing January 1, 1943, all work of analysis of water samples has been under the general supervision of Clarence H. Reed, Assistant Superintendent of the Sudbury Section of the Metropolitan District Commission.

Quabbin Aqueduct Operation

The Quabbin Aqueduct Reservoir intake works at Shaft 12, the Ware River intake works at Shaft 8, and the outlet works at Shafts 1 and 11A were kept ready for operation with the fine racks in place at Shafts 12 and 8. A rack of shallow depth on the invert at the bottom of Shaft 9 was also maintained and found to be effective in permitting the removal of some debris from this easily accessible portion of the tunnel. The pond back of the Ware intake dam was drained from July 17 to November 3, 1940, and thoroughly cleaned of debris which consisted mostly of matted root masses which had been brought down during the unprecedented flood of September, 1938, and which had badly clogged the intake racks during the subsequent periods of diversion. Thereafter it was drained each summer and cleaned of debris. A boom for the diversion of floating debris from the siphon spillway intakes was installed October 7, 1944.

The entire Wachusett Outlet Works were unwatered October 28 to November 18, 1944, for the first time since the original construction, and minor repairs made to the eroded channel downstream from the control gates. At the same time alterations were made in the sill of one of the stop shutterbays and all stop shutters were cleaned and painted and replaced in the grooves.

On September 7, 1943, a successful test was made of the emergency operation of adequate controls at Shaft 12. The tunnel was entered at Shafts 4, 8 and 12 at intervals for the purpose of inspection, and all linings were found in good condition.

The installation of an emergency gasoline-driven generator in the service building at Shaft 8 was commenced November 17, 1941, and completed February 18, 1942. At the top of Shaft 2 a spillway was constructed under Contract 112, as hereinafter described. At Shaft 1, the 900-horsepower motor for driving the tunnel unwatering pump was removed January 4, 1940, and shipped to the pump manufacturer to be fitted to the pump to be used at Shaft 4 of the Southborough Tunnel on the new pressure aqueduct for unwatering the tunnel, similar to the corresponding pump at the Wachusett outlet works. In 1940, the 144x90-inch Venturi meter in the shaft was re-equipped with pressure recorders adapted to the change from the previous gravity flow in the aqueduct to the pressure condition now obtained following the installation of control gates under Contract 65.

Inspection and Repair of Large Control Valves

A thorough inspection was made of several large control valves of the Dow-disc type used to control the flow at shafts 8 and 1 of Quabbin Aqueduct and at the Winsor Dam outlet works under severe high head conditions. The inspection was made to determine the extent of wear or damage to the valves from pitting which is caused by cavitation wherever very high velocities are encountered, which combined with irregularities in the conduit shapes cause local high vacuum conditions reducing the pressure below the vapor pressure of the water.

At Shaft 8, there is one main valve, 6-foot diameter, and three auxiliary valves, 5-foot diameter. The latter are used only occasionally. The conditions are particularly severe because the design, with the valves at the top of the helical-vaned shaft, involves an extremely high vacuum. The operation has continued since 1930. The helical lining has been inspected from time to time and no deterioration has ever been noted. A nozzle contraction below the main 6-foot valve is designed to prevent the highest vacuum in the shaft top from extending up through the interior of the valve itself. No damage was found to the valve body casting or to the valve seat. Some deterioration from pitting was found in the nozzle casting below the valve at a point near a very sharp curve and repairs were easily made by welding.

At Shaft 1 there are two 6-foot valves in series, one acting as a guard gate. They have been put to severe use on several occasions for discharging at full capacity from Quabbin Reservoir to Wachusett Reservoir, frequently for a month at a time without interruption. Here, too, the design includes a nozzle just down stream from the valve itself which is designed to prevent too high a vacuum where it can do damage. No pitting was found. During the unwatering operations repairs were made to correct some erosion of the channel, and riprapped slopes were repaired.

At the Winsor Dam outlet works there are two by-pass valves, one four feet and one two feet in diameter, which due to the war's delay in installing the proposed waterwheel have been operated under severe throttling conditions for a long period. Cavitation was discovered in both these valves and repairs are in progress. However, the principal purpose for which the larger four-foot valves was required has already been served, namely, to carry the entire flow of the river during and immediately following the construction of the Winsor Dam diversion tunnel plug under Contract 52, when the available head was relatively very small.

Hultman Aqueduct Operation

Commencing July 28, 1943, water was discharged directly from Wachusett Reservoir to the northern high service by continuous draft from the Norumbega Distributing Reservoir through the 7-foot diameter by-pass into the Weston Aqueduct supply mains and by replenishing Norumbega reservoir from the equalizing basin between the Wachusett Aqueduct terminal chamber and the pressure aqueduct intake during the day in the hours of operation of the Wachusett Power Plant.

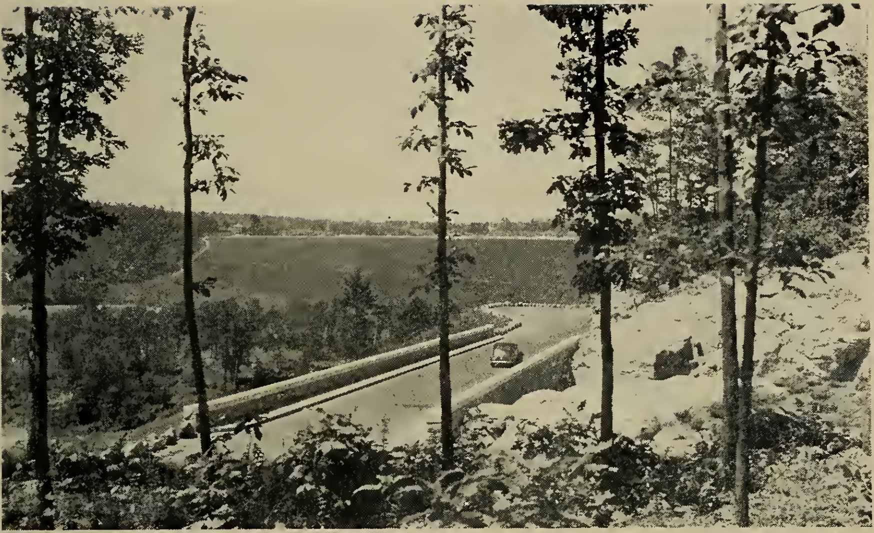
Normally water was run into the Norumbega Reservoir from 8:30 A.M. to 4:30 P.M. daily except weekends when the control works were left open under a lower draft from Saturday morning to Monday morning.

Occasionally, under increased draft, the flow in the aqueduct was continuous throughout the week.

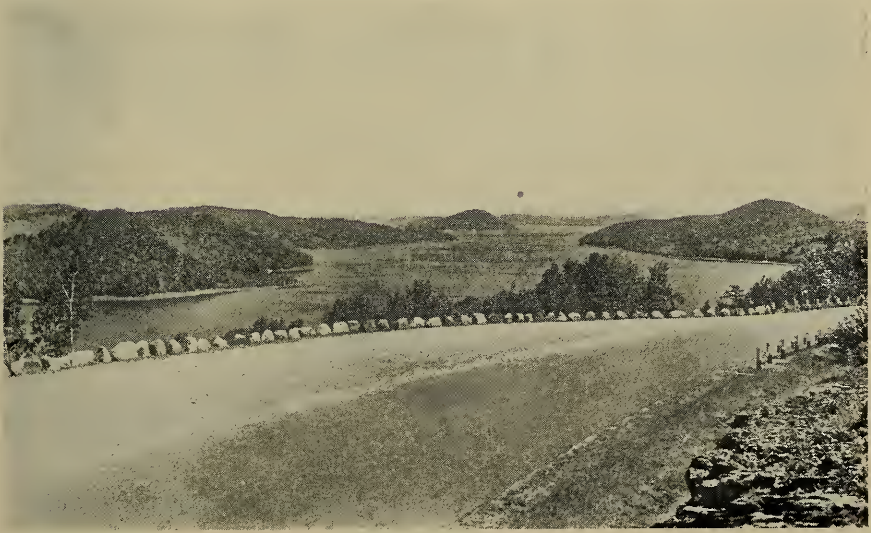
The Hultman Aqueduct intake works in Marlboro, the control works at Shaft 4 below the Sudbury Dam, and the Norumbega Reservoir gatehouse and emergency chlorinating plant were maintained with the fine racks in place at the intake.

Progress of Contracts

Contract 52.—Contract 52, for constructing the embankment of Winsor Dam, was continued to completion. The placing of riprap continued intermittently and was completed July 2, 1940. Soil dressing was resumed May 6 and completed June 18. Miscellaneous work at the intake gatehouse was completed June 22. The plugging of the stream control tunnel was continued to completion February 2, 1940, and the temporary opening through the lower intake fill was plugged with concrete, permanently establishing the sill of the lower intake at Elev. 427. Placing of the conduit on the fill in the stream control tunnel downstream from the plug was continued. The 72-inch steel pipe was all placed and the joints caulked January 28, the concrete envelope completed March 11, and the mortar lining May 6. The work of sealing off the downstream entrance and constructing an access conduit was started February 5, and completed May 14. Excavation for the foundation and walls of the outlet works building continued through December 18, 1939, after which the concrete foundations were constructed, including columns, beams and floor slabs, in readiness for the superstructure under Contract 111. The 60-inch control valve at the end of the main conduit laid on fill in the stream control tunnel was set in place January 18, 1940, and all other valves and piping completed June 15. All work at the outlet building was completed July 2. Soil dressing and seeding of the area near the toe of the dam was completed July 3. The access road to the outlet works, with a traffic circle on the rim of the outlet channel, was completed July 1. The road alongside the spillway and spillway channel, including boulder guard rails along the rim of the spillway excavation and the east and west access roads, were all completed early in July. Miscellaneous grading at the outlet channel was commenced April 9, and included a system



Winsor Dam, Looking Westerly from Bridge Over Spillway Channel



Quabbin Reservoir, Looking Northeasterly Toward the Middle Branch from Quabbin Hill Road

of rubble drainage gutters and walls against the high ledge face of the original stream control tunnel portal and berms and cobble gutters to take care of the drainage of the high slopes of the outlet channel. These drainage works were completed June 30, 1940.

Work on the main spillway channel was continued throughout the winter with the work of excavating, sealing of ledge and shaping up the bottom and slopes at the south end of the channel near the river. Gravel for the sub-base under the riprap on the slopes was spread and graded as the excavation and shaping up progressed. Riprap previously stored from the ledge excavation in the channel was placed through January and February. Soil dressing of the earth slopes was resumed May 6, 1940, and all loaming and seeding was completed early in July. Building of the rubble retaining walls along the spillway channel was discontinued during the winter, from December 16 to May 8, and completed about the middle of May. The setting of stone masonry in the spillway weir was continued and practically completed December 16. Cleaning and grouting of the weir was continued until January 27, 1940, suspended until April 15, and continued through May 7, when all masonry work on the weir was completed. Miscellaneous work was done during the spring at the spillway bridge, including the placing of concrete deflection walls on the sides of the channel downstream from the bridge. The ramp to the boathouse and seaplane hangar was completed in April and May down to an elevation approximately 50 feet below the reservoir flow line. All the work of cleaning up was completed July 12, 1940.

The final estimate, dated September 10, 1940, was for $2,439,727.82. The contractor's force in 1940 averaged 74 men, the maximum being 147 for the week ending December 9, 1939.

The total electrical energy used during 1940 was 35,585 kilowatt hours, making a total on the contract of 10,640,285 kilowatt hours.

The following subcontractors did substantial amounts of work under this contract.

Lane Construction Corp.	Bituminous macadam road surface
National Gunite Company	Lining 68-inch pipe in tunnel.

The total work done and materials furnished under the principal items of Contract 52 are as follows:

Earth excavation	244,350	cu. yds.
Rock excavation	134,420	“ “
Consolidated pervious embankment	39,000	“ “
Rolled impervious embankment	1,950	“ “
Embankment by full-hydraulic method	3,440,445	“ “
Miscellaneous embankment	195,960	“ “
Selected coarse material	139,570	“ “
Crushed stone or screened gravel	34,440	“ “
Light riprap	124,730	“ “
Heavy riprap	22,700	“ “
Paving	2,900	“ “
Soil dressing	71,060	“ “
Gravel sub-base for roads	11,920	“ “
Broken stone base for roads	3,410	“ “
Broken stone surface for roads	4,280	tons
Bituminous material	77,930	gallons
Stone walls	3,420	cu. yds.
Furnishing and placing grout	950	“ “
Portland cement	27,900	barrels
Concrete, Class A	4,610	cu. yds.
Concrete, Class B	4,950	“ “
Concrete, Class C	2,270	“ “
Reinforcing steel	329,074	pounds
Stone masonry	1,320	cu. yds.
Steel pipe for 68-inch conduit	382,900	pounds
Miscellaneous metal work	313,020	“
12, 18 and 24-inch tile pipe	9,000	lin. ft.

Contract 66.—Contract 66, for constructing regulating dams on the Middle and East branches of the Swift River, was continued to completion December 15, 1939, the work consisting of final cleaning up and burning of debris.

The final estimate dated September 14, 1940, was for $188,965.86.

Contract 67. Contract 67, for improving the access road to Shaft 9 of Quabbin Aqueduct, was started September 5, 1940. The work consisted of repairing damage done by abnormal floods in 1936 and 1938 and improving road surfacing and drainage. The contractor completed the total length of resurfaced roadway of about 575 feet of 2½-inch top course of broken stone surfacing and asphalt penetration September 17, 1940.

The final estimate, dated November 7, 1940, was for $1,428.96. The contractor's force averaged six men, the maximum being nine on September 12, 1940.

Contract 72.—Contract 72, for clearing a portion of the site of Quabbin Reservoir, was continued to completion December 15, 1939, the work consisting of removing and burning stumps, disposing of sawdust piles and cleaning up.

The final estimate, dated September 14, 1940, was for $476,374.54. The contractor's force during this short period of completion averaged 16 men, the maximum being 24 for the week ending December 2, 1939.

Contract 82.—Contract 82, for constructing Administration Road over Quabbin Hill, was continued to completion except for suspension of operations during the winter from December 16, 1939, to April 11, 1940. Berm ditches were excavated outside the slopes and in various cuts and excavations were made for additional side drains. Pipes were laid and ditches backfilled with trap rock. Stone fill bleeders in the slopes of cuts, cobble gutters and stone riprap and paving were placed at various locations to improve the drainage where needed, and loam and macadam berms were built on the road shoulders at various high fills to prevent erosion of the slopes. Boulder guard and multiple-cable type highway guard were place and final cleaning up completed June 5, 1940.

The final estimate dated August 10, 1940, was for $228,550.64. The contractor's force in 1940 averaged 31 men for twelve weeks, the maximum being 50 for the week ending May 18, 1940.

The total work done and materials furnished under the principal items of Contract 82 were as follows:

Roadway earth excavation	73,620	cu. yds.
Ledge excavation	21,335	" "
Ordinary borrow	47,420	" "
Crushed stone	22,530	tons
Bituminous material	156,580	gallons
Gravel borrow	26,520	cu. yds.
Highway guard	12,940	lin. ft.
Trench excavation	5,744	cu. yds.
Loam borrow	13,390	cu. yds.

Contract 93.—Contract 93, for completing the East Branch Baffle, was continued to completion January 6, 1940, the work consisting of miscellaneous earth excavation, placing of pervious fill, screened gravel and riprap and final cleaning up.

The final estimate dated February 21, 1940, was for $25,102.08. The contractor's force during this short period of completion averaged 26 men for six weeks, the maximum being 38 for the week ending December 9, 1939.

Contract 102.—Contract 102, for remodeling property of the Commission known as the Sauer House, consisted of four items. Work was completed under Item 1, for linoleum, September 7; under Item 2, for plumbing, September 18; under Item 3, for heating, August 15; under Item 4, for electrical work, September 17. This work was done with a force of two men. The total cost of all items was $1,524.50.

Contract 106.—Work under Contract 106, for the improvement of access roads in the Quabbin Reservoir area, consisted of the construction by regrading and surfacing of about 1.4 miles of existing road, 10 feet wide, from the existing Greenwich-Hardwick Road to the East Branch regulating dam and the extension of the same another 0.4 mile across the dam by surfacing, 10 feet wide, this short stretch of access road previously constructed and graded under Contract 66; the surfacing, 10 feet wide, of about 0.9 mile of access road to the Middle Branch regulating dam previously constructed and graded under Contract 66; the construction by regrading and surfacing of about 0.35 mile of existing road, 20 feet wide which connects the southerly end of the above access road to the East Branch regulating dam with the easterly end of the Shaft 12 access road constructed under Contract 60; the regrading and surfacing, 10 feet wide, of about 0.1 mile of the existing access road to Shaft 11A constructed under Contract 20;

and the construction by regrading and surfacing of about 0.8 mile of existing Blue Meadow Road, so-called, 16 feet wide extending from the Winsor Dam west access road northerly to the Commission's Belchertown nursery.

Work was started May 20, 1940, with clearing for a borrow pit area on the East Branch regulating dam access road, and excavation for this road was completed June 21. Excavation on the Blue Meadow Road was completed June 14 to 21. At the Middle Branch regulating dam most of the gravel for the two-inch mixed-in-place surface course was placed on the road June 21 to 23, and the seal coat was applied and completed during the week of July 19. Between June 12 and 30, on the East Branch regulating dam access road, the two-inch mixed-in-place gravel surface course was placed, mixed with tar and rolled, the fine grading completed and the loam placed on the slopes and seeded. The seal coat was applied and completed July 30 to August 6, 1940.

The final estimate dated October 22 was for $27,433.36. The contractor's force averaged 40 men for twelve weeks ending August 10, 1940, the maximum being 73 for the week ending July 20.

The principal items of plant were as follows:

5 power shovels
1 road grader
1 caterpillar tractor bulldozer
1 steam and 2 gasoline rollers
Miscellaneous trucks, etc.

Contract 107.—Contract 107, for constructing buildings on Quabbin Hill, involved two buildings, a utility building on the summit of the hill housing radio broadcasting equipment and including a tower for a fire lookout, and a public toilet building located just west of the summit and near the large automobile parking area constructed under Contract 82. Excavation of earth and ledge for the foundations of the utility building was started November 15 and completed December 1, 1940. The foundations were completed December 8, using transit-mixed concrete from Ware. All concrete work and granolithic finish for the tower stair landings was competed January 20, 1941, and all the remaining concrete work January 28. -Laying the field stone and brick for the walls of the tower and utility section was started December 9, and completed December 31, 1940, except for window sills in the tower which were completed January 31, 1941. Setting of glazed tile blocks for the interior and partition walls of the utility section of the building was started January 3, and practically completed January 15, 1941. Installation of steel stairways in the tower was started December 14, 1940, and completed January 13, 1941, and for the fire observation platform on January 24. The roof and cornice work was completed January 3, 1941, slate roofing February 10, and copper flashing February 14. All electrical work, plumbing, heating and painting was completed March 29, 1941. For protection of the work during the cold weather the entire tower and the one-story utility section, including the outside staging around the tower, was covered with tarpaulins and a steam boiler set up which provided heat commencing December 7, 1940.

Earth excavation for the foundation of the toilet building was completed November 21, 1940, and the concrete foundation placed. The laying of field stone and brick for the exterior walls was completed December 6, 1940. Tile masonry for the interior walls and the ceramic floor tile was started December 31, 1940, and completed January 7, 1941. Marble partitions were completed February 6. Framing for the roof was started December 6, 1940, and completed December 11, and the slate roof was completed December 24. Plastering, plumbing, ventilating, electric work, etc., and all trim were completed January 22, 1941, and painting March 6.

For the water supply installation, a 3000-gallon underground storage tank was constructed and completely installed with all accessories February 6, 1941. An underground pump chamber was built at the top of the deep well driven under Contract 120. The chamber was completed February 8, housing a temporary pump for the contractor's supply. This was taken out, the pump purchased for permanent installation was installed and the water supply storage tank filled, April 23, 1941.

The construction of the septic tank for the disposal of sewage outside the watershed was completed January 2, 1941, together with the 6-inch sewer lines from the two buildings.

Electric cables for connections to the buildings from the transmission line constructed under Contract 124 were laid in the trench excavated for the water and sewer lines. This underground electrical installation with protective creosoted timbers placed over the cables was completed in the trench backfill April 21, 1941. Gravel and crushed stone were purchased for the construction of paths between the buildings and the service parking area at the top of the hill and placed December 28, 1940. The penetrating and sealing casts of tar were completed December 31.

The final estimate, dated May 26, 1941, was for $72,477.06. In general, the contractor maintained one 8-hour shift, six days a week, although some operations were on two shifts and some work was done on Sundays. The contractor's force averaged 70 for seven weeks in 1940, and was much reduced after the end of the year, the maximum being 114 in the week ending December 14, 1940.

Contract 108.—Contract 108, for the construction of a ramp and utility wharf in the sheltered bay near the entrance to the spillway channel, was started in September, 1940, and excavation, filling and grading of the lower ramp was completed November 25. Similar work on the upper ramp, for providing access from the Quabbin Hill Road, was started October 16, and completed November 26. This included rubble retaining walls which were constructed October 8 to November 15. Paving and riprap protecting the slopes of the lower ramp and the turn-around area between the two ramps was practically completed before November 30, 1940. The grading of the anchorage basin to eliminate navigation hazards was completed September 27 to October 31. Ledge outcroppings were drilled and blasted. The base course of crushed stone in the approach ramp and turn-around area was placed and graded in December, 1940. The top course was completed and penetrating and sealing casts of asphalt applied December 10. Work was then continued on gutters along the approach ramp and on riprap protection of the main ramp. Cable guard rail was completed December 14. The timber float to be moored alongside the ramp and the gangplank were completed December 10. The construction of permanent fencing along the spillway channel was started with the drilling of holes in the capstones and the ledge December 16, 1940, and completed January 8, 1941. This completed all work for the contract except for painting, which, on account of the seasonal conditions, was omitted from the contract and done later by the Commission's labor force.

The final estimate, dated March 18, 1941, was for $18,528.27. The contractor's force averaged 12 men for 17 weeks, the maximum being 24 for the week ending October 19, 1940.

Contract 111.—Work under Contract 111, for constructing Winsor Dam outlet superstructure, was started October 15, 1940, with the excavation of trenches for electric connections to the transmission line constructed under Contract 124. The building is of brick masonry of stone trim and constructed on foundations previously built under Contract 52. Anchor bolts for the steel columns were set November 14. Structural steel was delivered to the job November 18 and its erection completed November 25. The laying of brick and stone masonry commenced November 25. Setting of brick for the walls was completed December 31, 1940. The brick was washed and the joints pointed January 24, 1941. The setting of glazed tile for the interior walls was started December 11, 1940, and completed January 11, 1941. Precast concrete roof slabs were placed January 6 to January 10, and the entire slate roof with copper cornices was completed January 22. Guniting of the structural steel roof support commenced with wrapping of wire mesh January 8, and was completed January 17. Plumbing, electrical work, installation Venturi meter recorders and all miscellaneous trim was completed April 16, and grading and loaming of the grounds and all other work May 19, 1941. For protection of the work during cold weather, a protective covering of tarpauline was used with heat supplied by coke and oil-burning salamanders.

The final estimate dated June 11, 1941, was for $48,060.36. The contractor's force averaged 8 men for five weeks, in 1940, increasing to a maximum of 47 on December 23, 1940, and being reduced to about 10 by the first of February, 1941.

The following subcontractors did substantial amounts of work under this contract.

Federal Electric Construction Co.	Electrical work
Dunnels and Lanagan	Plumbing
West End Iron Works	Structural steel

Contract 112.—Contract 112, for constructing a spillway at the top of Shaft 2 of Quabbin Aqueduct, was started in September, 1940, with the excavation and removal of old timbering used in making the original shaft excavation to sound ledge. The top of this shaft had been left, under Contract 14, in an incomplete state, pending decision as to the construction that would be necessary in case works for diverting the Quinapoxet River into the tunnel at this point should be found feasible. The work consisted of excavating and regrading the tunnel spoil areas near the shaft, encasing the top of the shaft with a concrete collar, and paving a spillway channel for a distance of approximately 200 feet away from the shaft toward the Quinapoxet River. Riprapping the new basin and channel was started September 12, and concrete masonry October 21. All the major items of work were completed November 18, 1940.

The final estimate dated January 21, 1941, was for $6,737.16. The contractor's force averaged 8 men, the maxmum being 13 for the week ending October 19, 1940.

Contract 116.—Work under Contract 116, for constructing a utility building in Quabbin Park Cemetery, consisted of dismantling the existing old wooden building which has been used until now to house tools and equipment for maintenance, and erecting on the site a new stone masonry building, housing public toilets in addition to the space for tools and equipment. The building contains a portico which will provide partial protection from the weather for some of the memorials removed from the abandoned towns in the reservoir area.

Work was started promptly, and the existing buildings razed October 29, 1940. The building foundations were completed October 30. The laying of stone masonry with stone collected and delivered at the site by the Commission's labor force, as hereinbefore noted, was completed October 31 to November 22, and damp-proofing was placed on the insides of the walls November 26 to 29. Concrete work, including the portico floor slab with granolithic finish, was completed November 29, using transit-mixed concrete. The cesspools and all plumbing work were completed November 11, and electrical work November 30. The roof framing and boarding were completed November 18 to 22. The setting of glazed tile blocks for the interior partitions was started December 3 and completed, washed and pointed December 30, 1940. The chimney was built, and all other rubble stone masonry completed, December 26, 1940, and pointed later, May 14, 1941. Laying of slate for the roof was started December 13 and completed with all flashing work December 31, 1940. Heating, plumbing, electrical work, and other trim, was completed December 30, 1940, and painting May 15, 1941.

The final estimate dated May 22, 1941, was for $10,871.36. The contractor's force averaged about 12 men for eight weeks, the maximum being 16 for the two weeks ending November 16, 1940.

Contract 118.—Work under Contract 118, for the construction of stone masonry posts and walls and other miscellaneous work at Winsor Dam and Quabbin Dike was started October 23, 1942. Under the provisions of the contract, the Commission was obligated to furnish stones for the masonry, cement, sand, gravel, loam and drain pipe, and to do miscellaneous work in preparation for the contractor's operations. A labor force averaging 10 men was so employed for about six weeks. The contractor started work on October 28 on the masonry posts.

The final estimate, dated July 29, 1943, was for $512.07.

Contract 119.—Work under Contract 119 consisted of furnishing and setting two granite pylons in the traffic circles at the ends of Winsor Dam. Foundations had previously been prepared by the Commission's labor force using ready-mixed concrete from Springfield. The stones were delivered at the site October 10, 1941, and set in position the following day. The lettering was cut by sandblasting and completed November 18. All work was completed February 21, 1942, when the bronze state seal on the pylon at the west end of the dam was set.

The final estimate dated June 8, 1942, was for $4,588.00. The greater part of the work was completed with an average force of two men for 16 days.

Contract 120.—Work under Contract 120 consisted of drilling a six-inch diameter well near the parking area on Quabbin Hill to determine in advance of the construction of the Quabbin Hill Buildings the possibility of obtaining a suitable water supply therefor. Work was started August 21, and completed September 6, 1940, with equipment consisting of one well-drilling rig. The well was started at about Elev. 999 and drilled to a depth of 165 feet. The casing was sealed to sound ledge. The 24-hour pump test showed a capacity of about 15 gallons per minute, which was satisfactory.

The final estimate, dated September 25, 1940, was for $677.40. The contractor's force averaged two men for three weeks.

Contract 124.—Work under Contract 124, for the construction of a transmission line between the Winsor Dam outlet works and the Quabbin Hill Buildings, started February 10, 1941, with the clearing for the pole line which was completed February 22. During the next two weeks poles were set and backfilled and all cross-arms, insulators, etc., installed. Placing all overhead and underground cables was completed April 5, and the installation of transformers and switch panels, April 15. All work of the contract was completed April 25, 1941.

The final estimate, dated May 2, 1941, was for $15,142.00. Most of the work was done in seven weeks, with a contractor's force which averaged 19 at the start and was reduced to 10.

Contract 125.—Work under Contract 125 consisted of the construction of a marine railway on the ramp in front of the Administration Buildings. The first load of rails was delivered on the job September 4, 1941. By September 11, the laying of the rails was completed except for final adjustments after the installation of the dolly. The fabrication of steel for the main ramp dolly, the caster dolly for moving equipment on the level from the head of the ramp to and from the hangar and boathouse was done in Somerville, Massachusetts. The first delivery of steel for the caster dolly was on October 6. All work was completed December 17, 1941, with the assembling and painting of the ramp dolly, caster dolly and removable bridge.

The final estimate, dated February 20, 1942, was for $8,800.00.

Opening of Hultman Aqueduct

Construction was sufficiently completed to permit plans for a celebration on October 23, 1940, of the opening by His Excellency, Governor Leverett Saltonstall, of the new pressure aqueduct into Norumbega Reservoir. Following an inspection of the Quabbin works, the Governor's party motored to the Ware River intake works in Barre where the Chief Engineer explained the automatic features of the operation of the diversion works. At the pressure aqueduct intake arrangements had been made for the Governor and party to inspect the interior of the 12½-foot diameter pipe. The Governor entered the gatehouse and opened the sluice gate, allowing the first water to enter the reservoir from the pressure aqueduct.

Careful plans were made in preparation for this event. The entire line was first inspected and cleaned, then the upper section, including two miles of the 12½-foot diameter pipe and three miles of 14-foot diameter tunnel under Sudbury Reservoir, was allowed to fill and this section was disinfected by heavy chlorination. The control gates at the uptake shaft from the tunnel were then opened and the disinfectant allowed to flow slowly through the entire length of the aqueduct past Norumbega Reservoir to a blowoff into the Charles River. The entire line was then thoroughly washed of the disinfectant by clean water from the upper intake. Throughout this entire process, and on the occasion of the first flow to and into the reservoir on October 23, careful plans had to be made for the safe acceleration of the entire body of water at the proper time but particularly to meet the requirements of the celebration. The water in the aqueduct was in effect a solid battering ram 18 miles long and weighing about 300,000 tons. The entire operation was successfully carried out according to schedule.

Storage and Flow Records

Quabbin Reservoir Storage and Release.—Following the plugging of the stream control conduit at Winsor Dam, as previously described, the storage of water in Quabbin Reservoir was commenced on August 7. 1939, the date of final closure of the gates shutting off the unrestricted flow of the river. Quabbin Reservoir has risen at a rate somewhat better than was estimated at the time storage was commenced. The accompanying table shows the annual rise in water level and the amount of storage accumulated. The figures in the table are for the storage above the sill of the lower intake in Quabbin aqueduct, Elevation 528.00. Below this sill and hence not available for draft to Wachusett Reservoir there are about 10,000 million gallons above the reservoir bottom. The quantities diverted from the Ware River to Quabbin Reservoir are given below.

Ware River Diversion.—Ware River water was first diverted westerly into Quabbin Reservoir March 21, 1940. Diversion both to Quabbin Reservoir and to Wachusett Reservoir continued intermittently in the amounts shown in the accompanying table.

Sewage Diversion from Ware River Watershed. The Rutland-Holden sewer continued in operation. On September 24, 1942, sewage was first received from the Holden Hospital to the completed central portion of the sewerage system of the Town of Holden. The entire system of sanitary sewers for the town, which was constructed as a WPA project, was accepted and put into operation by an agreement with the town dated November 2, 1943. The system of sanitary sewers for the Town of Rutland, which was similarly constructed as a WPA project, was accepted and put into operation by an agreement with the town dated September 17, 1945. The quantities discharged from the various institutions and towns into the sewerage system of the City of Worcester in the City's fiscal years, which coincide with the calendar years, are shown in the accompanying table.

Delivery from Hultman Aqueduct to Distribution System. Pending the extension of Hultman Aqueduct to Chestnut Hill via the proposed City Tunnel, this aqueduct has been used to a limited extent commencing July 28, 1943, to supply Spot Pond and to reinforce the Northern High Service through the connection to the Weston Aqueduct supply main extending northerly through Arlington and Belmont. It has also been used occasionally, commencing April 30, 1945, to reinforce the service to Chestnut Hill through the connection to

STORAGE IN QUABBIN RESERVOIR

(In addition to about 10,000 million gallons below sill of lower intake to Quabbin Aqueduct Elev. 428.00)

Storage Commenced August 7, 1939, with Water Surface at Elev. 393.9

	1939	1940	1941	1942	1943	1944	1945
Elevation on December 31:							
Behind Middle Branch Regulating Dam		530.00	527.10	530.15	530.04	530.10	530.12
Behind East Branch Regulating Dam	524.12	530.21	530.08	530.55	530.39	530.62	530.39
Behind East Branch Baffle		477.12	475.74				
Main Reservoir	422.0	469.03	472.14	488.71	500.50	507.24	520.72
Intermediate Peaks, if any:							
High Point Elev.		465.91	477.04	485.10	501.45	508.26	520.14
On		Aug. 8	July 31	July 31	Aug. 5	July 7	June 27
Low Point Elev.		465.65	470.85	484.87	498.33	505.35	519.02
On		Oct. 29	Oct. 31	Sept. 27	Oct. 14	Sept. 12	Sept. 29
Million Gallons Available Dec. 31							
Above the ground contours	720	71,640	80,620	140,650	203,540	242,180	333,140
Estimated ground storage	80	10,300	10,400	10,140	10,630	12,830	14,070
Total	800	81,940	91,020	150,790	214,170	255,010	347,210
Elevation of Main Reservoir		467.39	471.40	486.77	500.21	506.47	519.92
and Total Million Gallons		71,940	83,620	143,390	213,970	250,210	341,290
At end of Fiscal Year on		Nov. 30	Nov. 30	Nov. 30	Nov. 30	Nov. 30	June 30
M. G. Drawn to Wachusett Reservoir	None	None	20,462	None	17,020	25,425	22,008
From			Sept. 17		Aug. 6	June 13	June 27
To			Oct. 28		Sept. 7	Sept. 11 intermittent	Sept. 22 intermittent

WARE RIVER DIVERSION

	1939	1940	1941	1942	1943	1944	1945
Million Gallons Diverted:							
To Quabbin Reservoir		20,451.1	4,430.8	12,368.1	17,254.9	13,482.5	18,779.4
To Wachusett Reservoir	541.6	1,857.7	2.8	554.7	.0	1,359.9	.0
Total	541.6	22,308.8	4,433.6	12,922.8	17,254.9	14,842.4	18,779.4
Maximum M.G. in one day		1,062.6	201.3	1,026.2	378.8	1,505.5	508.3
Total M.G. in the Fiscal Year		21,154.6	5,144.9	11,875.6	18,394.6	12,573.9	14,120.2
from the previous Dec. 1 to		Nov. 30	Nov. 30	Nov. 30	Nov. 30	Nov. 30	June 30
Seasonal Diversion Stopped	May 31	June 14	June 7	June 15	June 12	May 18	June 11
Began	Nov. 1	Nov. 14	Dec. 15	Nov. 4	Oct. 28	Nov. 29	Nov. 20
Emergency Diversion Began						June 24	
Stopped						July 7	
Began						Sept. 15	
Stopped						Sept. 19	

GALLONS OF SEWAGE DIVERTED INTO WORCESTER SEWERAGE SYSTEM

	1940	1941	1942	1943	1944	1945
Rutland State Sanatorium	29,793,000	25,643,000	27,210,000	26,156,000	31,942,000	29,348,000
U. S. Veterans Hospital	26,980,000	21,022,000	21,809,000	19,341,000	34,773,000	35,060,000
Town of Holden			1,958,000	7,300,000	7,345,000	19,072,000
Town of Rutland						5,550,000
Total	56,773,000	46,665,000	50,977,000	52,797,000	74,060,000	89,030,000

the Weston Aqueduct supply main extending easterly through Brighton. The total supplied to the distribution system in this manner is shown in the following table:

Gallons Delivered to Distribution System

	1943	1944	1945
January		812,740,000	970,670,000
February		720,970,000	959,530,000
March		680,950,000	949,420,000
April		594,260,000	917,630,000
May		669,710,000	1,774,380,000
June		781,420,000	1,645,010,000
July	116,860,000	822,880,000	1,407,280,000
August	972,110,000	853,750,000	988,970,000
September	578,780,000	1,034,990,000	855,810,000
October	602,460,000	810,780,000	844,480,000
November	634,020,000	702,780,000	1,007,680,000
December	704,590,000	682,330,000	1,586,620,000
Total	3,608,820,000	9,167,560,000	13,907,480,000

The totals delivered in the fiscal years were as follows:

2,904,230,000 gals. in the year ending Nov. 30, 1943.
9,189,820,000 gals. in the year ending Nov. 30, 1944.
7,898,970,000 gals. in the seven months ending June 30, 1945.

Dedication of Winsor Memorial

The memorial to former Chief Engineer Frank E. Winsor, located alongside Administration Road at Quabbin Reservoir overlooking Winsor Dam, was dedicated June 17, 1941. This memorial was erected by Mr. Winsor's many friends and sponsored by the Boston Society of Civil Engineers and the Northeastern Section of the American Society of of Civil Engineers. It was presented on behalf of the engineers by George T. Seabury, a lifelong friend of Mr. Winsor and Secretary of the American Society of Civil Engineers, and unveiled by Edward Winsor, Jr., a grandson. It was accepted for the State by His Excellency, Governor Leverett Saltonstall, and Chairman Eugene C. Hultman of the Commission accepted its custodianship. About 250 officials and guests attended the dedication, following which they were served luncheon in the Commission's seaplane hangar in the Administration Buildings and were conducted on a tour over the work.

List of Drawings and Tables Appended Hereto

Takings of Real Estate and Water Rights for Quabbin Supply.
Status of Contracts completed between November 30, 1939, and June 30, 1945.
Status of Contracts in Force on June 30 1945.
Canvass of Bids, Contract 94.
Canvass of Bids, Contract 110.
Canvass of Bids, Contract 111.
Monthly Rainfall at Stations on Ware and Swift Watersheds, 1940 to 1945, inclusive.

For data on contracts completed prior to November 30, 1939, see sixth to fourteenth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1940, see 1935 to 1939 annual reports, inclusive.

Respectfully submitted,
KARL R. KENNISON, *Chief Engineer.*

20 Somerset Street, Boston, Mass.
January 15, 1946.

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

TAKINGS OF REAL ESTATE AND WATER RIGHTS FOR SWIFT AND WARE RIVER SUPPLIES

Taking for	Taking No.	Town	County	Date of Taking	Plan No.	Title Vested in Commonwealth	
						Fee (Acres)	Easement (Acres)
Wachusett Coldbrook Tunnel Section of Quabbin Aqueduct	1 to 4 incl.	Details previously reported in the 1930 Annual Annual Reports			T-1 to T-13 incl.	570.22	20.37
Coldbrook Swift Tunnel Section of Quabbin Aqueduct	1 to 3 incl.	Details previously reported in the 1931 and 1940 Annual Reports			T-14 to T-27 incl.	128.05	4.06
Quabbin Reservoir	1 to 29 incl.	Details previously reported in the 1931, 1932, 1933, 1934, 1935, 1936, 1937 and 1938 Annual Reports			S-1 to S-76 incl.	75,169.38 (Also Water Rights)	20.09
" "	30	Petersham	Worcester	May 4-44	S-78	72.48	
" " (Taking of Waters of the Swift River above Winsor Dam)		Details previously reported in the 1939 Annual Report			None	Water Rights	
Ware River Watershed	W-1	Oakham	Worcester	Sept. 1, 1931	W-1	0.25	
" " " "	W-2	Oakham, Barre Rutland	"	Mar. 27, 1941	W-2 to W-8 incl.	8120	
" " " "	W-3& W-4	Hubbardston, Rutland	"	Apr. 1, 1943	W-9 to W-14 incl.	8273	
" " " "	W-5	Rutland	"	May 27, 1943	W-15	14	
" " " "	W-6	Rutland	"	Jan. 10, 1944	W-16 to W-19 incl.	183	

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS IN FORCE ON JUNE 30th, 1945

Contract No.	Description	Contractor	No. Bids	Contract Executed	Basis of Award	Payments to date
33	Purchase of Power at Shaft 1	New England Power Co.	Date of Agreement	Aug. 6, 1931	Agreed Rates	$11,668.61
42	Use of Worcester Sewerage System and Treatment Works a/c Rutland-Holden Sewer	City of Worcester	Date of Agreement	May 1, 1933	Lump Sum $325,000. Annual Charges *	325,000.00 4,450.82
46	Connection with Rutland-Holden Sewer & Disposal of Sewage from the U. S. Veterans Hospital	U. S. Veterans Admin. (Note: Payments under Cont. 46 are RECEIVED by the MDWSC)	Date of Agreement	Nov. 7, 1934	Lump Sum $37,000. Annual Charges *	37,000.00 4,277.36
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium	Rutland State San. (Note: Payments under Cont. 48 are RECEIVED by the MDWSC)	Date of Agreement	June 5, 1934	Lump Sum $60,000. Annual Charges *	60,000.00 88.37
148	Sale of Power at Winsor Dam	New England Power Co. (Note: Net payments under Cont. 148 are RECEIVED by MDWSC)	Date of Agreement	May 1, 1945	Agreed Rates	None

* Proportion of Annual Maintenance Cost.

COMMONWEALTH OF MASSACHUSETTS

METR. DIST. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945

Contract No.	Description	Contractor	No. of Bids ‡	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
49	Excavating diversion channels at site of Quab. Res.	Cenedella & Co.	12	10/1/35	$79,050.00	$87,928.70	1/24/41
52	Construction of Main Dam of Quabbin Reservoir	Benjamin Foster Co.	9	8/24/36	2,317,445.00	2,439,727.82	1/ 8/41
66	Regulating Dams on Middle & East Branches of the Swift River	C. & R. Construction Co.	11	10/25/38	171,650.00	188,965.86	§ 9/14/40
67	Surfacing Access Road at Shaft #9, Quab. Aqueduct	George E. Duteau	6	8/27/40	1,546.61	1,428.96	§11/7/40
68	Connections with Rutland-Holden Sewer & Disposal of Sewage from Town of Rutland	Town of Rutland Date of Agreement Oct. 3, 1938—Annual Charges* (Note: Payments under Cont. 68 are RECEIVED by the MDWSC)					None
69	Connections with Rutland-Holden Sewer and Disposal of Sewage from Town of Holden	Town of Holden Date of Agreement Aug. 31, 1938—Annual Charges* (Note: Payments under Cont. 69 are RECEIVED by the MDWSC)					None
72	Clearing portion of Site of Quabbin Reservoir on Upper Middle and East Branches of Swift River	C. & R. Construction Co.	4	10/25/38	469,975.00	476,374.54	§ 9/14/40
73	Inverted Pipe Siphons on Weston Aqueduct	Leo Butler Company	8	11/17/38	265,832.50	261,467.58	§ 7/19/40
74	Constructing the Southborough Tunnel, Section 2 of the Pressure Aqueduct	West Construction Co.	8	12/30/38	3,197,015.00	2,933,832.49	§ 9/27/40
75	Constructing Cut-and-Cover Aqueduct, Section 1 of the Pressure Aqueduct	B. A. Gardetto, Inc.	7	3/10/39	503,871.38	521,806.66	§ 1/29/41
77	Constructing Cut-and-Cover Aqueduct, Section 3 of the Pressure Aqueduct	B. A. Gardetto, Inc.	6	5/ 3/39	497,382.48	496,597.43	§ 1/24/41

* Proportion of Annual Maintenance Cost.
§ Contract financed with aid of Federal Grant.
‡ The above contracts were all awarded to the lowest bidder.

STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids ‡	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
78	Constructing Cut-and-Cover Aqueduct, Section 4 of the Pressure Aqueduct	American Concrete & Steel Pipe Co.	15	3/20/39	535,554.60‡	551,629.18	§11/7/40
79	Constructing Cut-and-Cover Aqueduct, Section 5 of the Pressure Aqueduct	" "	11	3/20/39	536,950.22‡	522,335.25	§ 9/30/40
80	Constructing Norumbega High Leval Reservoir on Pressure Aqueduct	Carlo Bianchi and Co., Inc.	6	6/15/39	478,605.49	574,183.69	§ 5/13/41
81	Constructing Cut-and-Cover Aqueduct, Section 6 of the Pressure Aqueduct	M. F. Gaddis, Inc.	6	4/26/39	560,432.25	615,154.67	§ 3/13/41
82	Constructing Quabbin Hill Road	G. Rotondi & Son	10	3/9/39	219,060.92	228,550.64	§ 8/30/40
83	Constructing Spot Pond By-Pass	S. Rotondi & Sons	12	8/29/39	143,928.28	141,894.22	§12/16/40
83A	Electric Wiring, Spot Pond By-Pass	J. J. Reddington Electric Service Co.	5	9/20/40	2,335.00	1,095.00	§ 6/4/41
84	Head House, Shaft 4 for Pressure Aqueduct	John F. Griffin Co.	5	9/18/40	104,986.54	100,673.01	§10/1/41
85	Furnishing and Delivering Pre-Cast Steel Cylinder Reinf. Concrete Pressure Pipe for Pressure Aqueduct	Lock Joint Pipe Co.	4	12/28/38	4,164,126.50	4,198,409.03	§10/15/40
86	Furnishing and Delivering Gate Valves for Pressure Aqueduct	The Chapman Valve Manufacturing Company	4	6/15/39	79,330.70	81,086.10	§ 7/11/40
87A	Valves for Pressure Aqueduct	Gilbert Howe Gleason & Co.	2	7/6/39	7,515.00	7,515.00	§12/28/39
87B &C	Furnish and Deliver Needle Valve & Discharge Control Valve for Pressure Aqueduct	" "	1	6/30/39	18,917.00	18,917.00	§ 7/11/40
87D	Furnish and Deliver-Flap Valve and Gate Valves	Crane Company	8	7/31/39	2,527.47	2,527.47	§ 4/15/40

87E	Furnish and Deliver Meter Register-Indicator, Recorders & Piezometer Rings	Builders Iron Foundry	2	7/11/39	6,323.00	6,323.00	§ 7/1/40
87F	Furnish and Deliver Tunnel Unwatering Pump for Pressure Aqueduct	Warren Steam Pump Company Inc.	1	7/6/39	3,354.00	3,339.00	§ 7/16/40
87G	Furnish and Deliver Sump Pump	Lunt Moss Company	5	7/7/39	746.50	746.50	§ 5/16/40
87H	Furnish and Deliver Air Blower	B. F. Sturtevant Company	1	7/6/39	465.67	465.67	§ 5/24/40
89	Constructing Mortar Lining in Existing Sudbury River and Happy Hollow Steel Pipe Siphons of the Western Aqueduct	Marinucci Brothers and Company	5	11/6/39	38,417.75	42,940.85	§ 6/28/40
90A	Furnish and Deliver Gasoline engine driven, Electric Generating Unit, Complete for Pressure Aqueduct	Sandberg Equipment Co.	1	11/14/39	1,224.00	1,224.00	§ 7/24/40
90B	Furnish and Deliver Traveling Crane and Chain Hoists for Pressure Aqueduct	Robert Abel, Inc.	1	9/11/39	2,359.25	2,359.25	§ 6/4/40
90C	Furnish and Deliver Flanged and Spigot Pipes and Elbows	Fred A. Houdlette & Son, Inc.	3	9/15/39	2,110.47	2,110.47	§ 3/7/40
90D	Furnish and Deliver Special Two-way Bronze Stop Valve	Lombard Governor Corp.	1	9/14/39	459.75	459.75	§ 5/13/40
90E	Furnish and Deliver Motor driven Sump Pump of Deep Well Turbine Type	Lunt Moss Company	1	9/11/39	257.00	257.00	§ 7/20/41
92A, B,C	Furnish and Deliver Gate Valves, Check Valve and Regulating Valve	The Chapman Valve Manufacturing Company	1	8/16/39	24,073.00	24,198.00	§ 6/29/40
92D	Furnish and Deliver Pressure Relief Valves	Lombard Governor Corp.	1	8/21/39	2,774.10	2,774.10	§ 5/13/40
92E	Furnish and Deliver Flange, Spigot and Special Pipes, Sleeve and Tee	Warren Foundry & Pipe Corp.	3	8/23/39	7,971.44	7,971.44	§ 5/15/40
93	Completing the East Branch Baffle	J. J. Callahan	9	10/27/39	28,876.75	25,102.08	§ 2/21/40
94	Proposed Charles River Shaft	John MacDonald Construction Co.	13	2/20/40	215,548.45	190,396.32	§ 1/21/41
95A, B &	Charles River Shaft Equip. (Sluice Gate Valves)	Chapman Valve Co.	1	2/19/40	38,170.00	38,170.00	§10/18/40

STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids ‡	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
95C	Sluice Gates	"	4	2/19/40	3,636.00	3,636.00	§ 9/22/40
95D	Deep Well Pump	Duro Pump Co.	5	2/4/40	997.50	997.50	§ 5/27/40
95E	Electrical Equipment	Westinghouse Electric & Mfg. Co.	1	4/16/40	1,335.89	1,241.80	§ 9/13/40
95F	Hydraulic Operative Valve	Evans Mills Supply Co.	1	2/12/40	583.00	583.00	§ 5/23/40
95G	Stone bounds	H. E. Fletcher	4	2/13/40	1,249.00	1,249.00	§ 8/9/40
95H	Padlocks	Chandler & Barber Co.	2	2/21/40	465.00	465.00	§ 7/22/40
95I	Flanges, Pipes & Fittings	Pittsburgh Piping & Equipment Co.	1	3/4/40	7,535.00	7,794.00	§10/7/40
96	Constructing Chlorine Storage House, etc.	Chandler Constr. Co. Inc.	20	4/5/40	48,387.00	54,795.38	§ 5/31/41
97	Diesel-engine driven pumping unit for Spot Pond	Ralph P. Hall, Inc.	5	4/22/40	11,476.00	11,476.00	§10/2/40
99	Enlarging Fells High Level Distributing Res.	Middlesex Constr. Co.	11	1/9/40	134,380.93	145,115.80	§12/17/40
100	Placing Mortar Lining in the Wachusett Aqueduct at the Assebet River Crossing	The Nat'l Gunite Contracting Co.	3	10/27/39	$5,805.80	$6,011.25	§ 4/16/40
101	Furnishing, Delivering & Erecting Bronze Tablets	Dimond-Union Bronze Works	3	1/30/40	397.68	397.68	§ 9/15/40
102-1	Furnishing & Laying Linoleum & installing complete plumbing, Heating & Electric Systems in Sauer Residence	Springfield Floor Covering Center	3	3/8/40	85.50	80.50	11/12/40
102-2	" " " "	R. G. Harrington	4	7/11/40	615.00	615.00	11/22/40
102-3	" " " "	The Mutual Plumbing & Heating Co.	4	7/11/40	578.00	578.00	10/16/40

102-4	" " " "	Springfield Elec. Company, Inc.	3	8/3/40	251.00	251.00	11/21/40
103	Furnishing, equipping & delivering work boat for use on Quab. Res.	Quincy Adams Yacht Yard, Inc.	5	10/25/40	12,975.00	13,461.00	§ 6/19/41
104A	Furn. & del. valves, sluice gate, elec. hoists & fabricated steel pipe	Chapman Valve Mfg. Co.	1	4/26/40	1,444.00	1,444.00	§ 9/21/40
104B	"	Crane Co.	2	5/7/40	1,115.00	1,115.00	§11/4/40
104C	"	Robert Abel, Inc.	1	4/26/40	2,047.50	2,047.50	§ 7/29/40
104D	"	The Walworth Co.	8	5/7/40	1,822.40	1,822.40	§ 9/5/40
105	Furn. & install. lightning protection systems	Boston Lightning Rod Co.	4	6/4/41	4,135.00	4,335.00	2/13/42
106	Improvement of Access Roads to Middle & East Branch Reg. Dams & elsewhere	A. R. Montuori & Co.	5	6/5/40	28,298.71	27,433.36	§10/22/40
107	Constructing Quab. Hill Bldgs.	H. P. Cummings Constr. Co.	2	12/2/40	71,165.00	72,477.06	§ 5/26/41
108	Constructing Ramp & Utility Wharf	J. J. Callahan	4	9/27/40	18,117.75	18,528.27	§ 3/18/41
109	Furn. & Install'g radio system	Kenworthy & Taylor, Inc.	5	10/30/40	20,341.92	20,988.60	§11/14/41
110	Extending Charles River Shaft No. 5	C. & R. Construction Co.	7	9/13/40	261,282.57	205,194.97	§ 7/10/41
111	Constructing Winsor Dam Outlet Superstructure	Chandler Construction Co., Inc.	6	10/18/40	47,788.23	48,060.36	§ 6/11/41
112	Constructing a Spillway at Top of Shaft 2 of Quab. Aque.	Wachusett Engineering Company, Inc.	12	9/16/40	6,671.05	6,737.16	§ 1/21/41
113	Making Core Borings in Counties of Middlesex, Norfolk & Suffolk	Riley Engineering & Drilling Company	6	8/6/40	14,839.30	13,553.46	4/28/41
114	Diamond Drill Borings	B. F. Smith & Co., Inc.	1	8/24/42	4,200.00	3,707.42	12/3/42
116	Constructing Utility Bldg. in Quab. Park Cemetery	Chandler Construction Company, Inc.	5	10/25/40	10,452.00	10,871.36	§ 5/22/41
118	Constructing stone masonry posts and walls and other misc. work at Winsor Dam and Quab. Dike	A. R. Montuori	2	10/22/42	4,979.30	4,701.79	8/26/43

STATUS OF CONTRACTS COMPLETED BETWEEN NOVEMBER 30, 1939 AND JUNE 30, 1945—(Continued)

Contract No.	Description	Contractor	No. of Bids ‡	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
119	Furnishing & setting granite pylons in traffic circles at the ends of Winsor Dam	W. C. Canniff & Sons, Inc.	4	5/13/41	4,588.00	4,588.00	6/8/42
120	Drilling well for water supply	R. E. Chapman Co.	2	8/15/40	800.00	677.40	11/12/40
121	Furnish and Delivering travelling cranes	The Euclid Crane & Hoist Company	2	9/23/40	9,445.00	9,445.00	§ 1/10/41
122	Furnishing and Delivering equip. for Venturi Meters	Builders Iron Foundry	1	9/23/40	4,567.00	4,567.00	§ 2/10/41
123A	Furnishing and Delivering Stop Shutter Lifters	A. L. Smith Iron Co.	3	12/4/40	315.00	315.00	§ 2/11/41
123B	Furnishing and Delivering Quabbin Hill pump	Food Machinery Corp. Peerless Pump Division	5	12/14/40	381.00	381.00	§ 6/2/41
124	Constructing a transmission line	George W. Ellis Co., Inc.	3	7/3/41	15,142.00	15,142.00	§ 5/2/41
125	Constructing Marine Railway at Quabbin Reservior	Berke-Moore Company	1	8/25/41	8,800.00	8,800.00	2/20/42
127	Furnishing and installing switchboard equipment in District's power plant at Sudbury Dam	A. C. Senecal Co.	3	7/18/41	2,263.00	2,405.00	3/22/42
128	Furnishing & Delivering Padlocks	Chandler & Barber Co.	3	3/6/41	310.00	310.00	§ 8/4/41
129	Constr. Drainage Pipe Line	John Williams	11	3/6/41	475.00	475.00	§ 6/30/41
130	Grading, Loaming and Grassing & Improving Access Roads	Lee Crane Service, Inc.	5	5/5/41	6,706.61	9,999.00	§ 6/17/41

MONTHLY RAINFALL IN INCHES AT STATIONS OF THE WARE WATERSHED

1940

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Ware River Intake Works*	2.16	3.49	4.30	5.61	5.44	2.17	3.51	1.36	1.80	1.15	6.25	2.67	39.91
West Rutland*	2.31	3.62	4.45	5.83	5.45	2.18	3.45	1.53	1.80	1.24	6.59	2.78	41.23
North Rutland	1.34	3.46	3.25	5.31	5.28	3.43	3.65	1.37	2.00	1.18	7.64	2.15	40.06
Williamsville	2.39	3.62	4.19	6.94	5.86	2.47	4.45	2.13	2.36	1.10	6.65	2.10	44.26
Hubbardston	1.98	2.69	3.89	5.63	5.57	2.15	4.99	1.88	1.96	1.06	7.11	2.86	41.77
1940 Mean	2.04	3.38	4.01	5.86	5.52	2.48	4.01	1.65	1.98	1.15	6.85	2.51	41.44
17-Year Mean	3.42	2.88	3.69	3.70	3.39	4.01	4.04	3.90	5.08	3.24	3.57	3.10	44.02

1941

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Ware River Intake Works*	2.55	2.14	1.82	0.49	2.62	3.19	5.38	2.47	0.93	2.00	2.77	3.03	29.39
West Rutland*	2.50	2.22	1.98	0.52	2.94	3.23	5.46	2.98	0.72	2.27	2.88	3.46	31.16
North Rutland	2.46	2.28	1.19	0.50	3.23	3.96	6.38	3.19	0.73	2.68	3.15	2.70	32.45
Williamsville	2.29	1.60	1.82	0.90	3.69	3.65	4.46	2.92	1.29	2.70	3.36	2.71	31.39
Hubbardston	1.78	2.02	1.32	1.01	3.48	3.25	4.31	3.01	0.94	2.60	3.01	2.65	29.38
1941 Mean	2.32	2.05	1.63	0.68	3.19	3.46	5.20	2.91	0.92	2.45	3.03	2.91	30.75
18-Year Mean	3.36	2.83	3.57	3.53	3.38	3.98	4.10	3.85	4.85	3.20	3.54	3.09	43.28

MONTHLY RAINFALL IN INCHES AT STATIONS OF THE WARE WATERSHED

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
					1942								
Ware River Intake Works*	3.77	2.56	5.72	1.04	4.58	4.78	5.94	2.20	3.26	2.93	5.18	5.00	46.96
West Rutland*	3.45	2.39	5.15	1.01	4.98	4.19	4.39	2.45	3.24	2.98	4.78	4.54	43.55
North Rutland	3.69	2.40	6.01	0.92	4.18	5.27	5.45	1.67	2.98	4.23	3.58	3.33	43.71
Williamsville	3.71	2.06	6.72	0.94	3.25	5.63	6.43	1.95	3.11	3.90	4.67	4.80	47.17
Hubbardston	3.04	1.73	6.64	1.01	3.30	4.52	6.36	1.45	2.75	3.52	4.35	3.30	41.97
1942 Mean	3.53	2.23	6.05	0.98	4.06	4.88	5.71	1.94	3.07	3.51	4.51	4.20	44.67
19-Year Mean	3.37	2.80	3.70	3.40	3.41	4.03	4.19	3.75	4.75	3.21	3.59	3.15	43.35
					1943								
Ware River Intake Works*	3.13	1.48	3.32	3.95	5.14	1.55	3.80	2.46	0.72	6.00	6.21	0.57	38.33
West Rutland*	2.98	1.24	3.46	3.93	5.17	1.66	4.23	1.44	0.68	5.64	6.03	0.73	37.19
North Rutland	3.29	1.81	2.54	2.55	4.49‡	1.88	4.81‡	2.68	1.12	5.00	5.08‡	0.32	35.57
Williamsville	3.28	1.68	2.89	3.59	5.65	2.24	4.63	3.70	1.12	5.28	6.38	0.61	41.05
Hubbardston	2.59	1.36	2.46	3.54	4.77	1.80	4.62	3.58	1.20	5.01	5.59	0.76	37.28
1943 Mean	3.05	1.51	2.93	3.51	5.04	1.83	4.42	2.77	0.97	5.39	5.86	0.60	37.88
20-Year Mean	3.35	2.74	3.66	3.41	3.50	3.92	4.20	3.70	4.56	3.32	3.70	3.02	43.08

1944

Ware River Intake Works*	1.25	2.38	4.48	4.41	1.22	8.01	1.86	1.08	7.82	1.51	3.64	3.09	40.75
West Rutland*	1.58	2.59	4.62	4.55	1.25	8.51	1.65	0.83	7.84	1.65	4.13	3.26	42.46
North Rutland	1.11	2.74	3.78	3.21	1.26	8.31	1.95	1.44	7.56	1.82	3.53	2.82	39.53
Williamsville	1.11	2.30	4.51	4.15	1.45	9.08	2.59	0.79	7.48	1.74	3.43	3.16	41.79
Hubbardston	1.16	1.85	4.03	3.63	1.44	11.82	2.46	1.12	7.43	1.58	2.73	3.01	42.26
1944 Mean	1.24	2.37	4.28	3.99	1.32	9.15	2.10	1.05	7.63	1.66	3.49	3.07	41.35
21-Year Mean	3.25	2.72	3.69	3.43	3.39	4.18	4.10	3.57	4.71	3.24	3.69	3.02	42.99

1945

Ware River Intake Works*	3.73	3.98	2.02	5.40	5.58	6.50	4.93	3.25	1.90	2.80	4.08	4.08	48.25
West Rutland*	3.75	4.26	2.11	4.49	5.40	6.52	5.77	3.42	2.00	2.95	4.11	4.48	49.26
North Rutland	2.07	4.48	1.89	4.82	5.26	6.75	4.27	3.78	1.64	1.48	4.97	4.05	45.46
Williamsville	3.26	4.40	1.72	5.38	5.87	6.62	6.79	4.64	1.24	2.51	3.57	4.27	50.27
Hubbardston	2.29	3.93	1.44	4.69	4.86	6.18	6.18	3.76	1.41	2.73	3.43	3.45	44.35
1945 Mean	3.02	4.21	1.84	4.96	5.39	6.51	5.59	3.77	1.64	2.49	4.03	4.07	47.52
22-Year Mean	3.24	2.79	3.61	3.50	3.48	4.27	4.17	3.58	4.57	3.21	3.71	3.07	43.20

* Station maintained By Metropolitan District Water Supply Commission. Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

‡ Interpolated.

Monthly Rainfall in Inches at Stations of the Swift Watershed

1940

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
West Ware	1.55	2.27	4.33	5.45	4.39	Discontinued							
Administration Building*	1.91	2.08	4.45	6.23	4.84	1.80	3.96	2.06	2.34	1.52	6.98	2.31	40.48
Shutesbury	2.87	3.20	4.75	5.35	7.21	3.08	4.78	2.87	2.74	1.31	7.41	2.69	48.26
Wendell	2.84	3.17	5.83	5.89	6.86	3.42	4.48	2.31	2.72	1.34	6.32	3.88	49.06
Petersham (Harvard Forest)**	1.90	4.21	5.57	6.86	5.82	2.47	4.09	2.09	2.54	1.25	6.96	3.34	47.10
Petersham (Nichewaug)*	2.15	2.66	5.28	7.08	6.31	2.60	4.28	2.12	2.18	1.07	6.61	3.05	45.39
Pelham*	2.19	2.25	4.83	6.11	7.09	3.05	3.51	2.28	2.41	1.51	7.64	2.32	45.19
1940 Mean***	2.31	2.93	5.12	6.25	6.35	2.74	4.18	2.29	2.49	1.33	6.99	2.93	45.91
21-Year Mean***	3.54	2.97	3.66	4.22	3.58	4.74	4.13	4.08	4.94	3.18	4.10	3.31	46.45

1941

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Administration Building*	1.91	1.57	1.30	0.87	2.67	3.40	6.65	4.07	1.21	2.55	3.56	2.90	32.66
Shutesbury	2.15	1.81	1.56	0.55	2.05	4.49	3.85	3.18	1.38	3.18	2.64	4.95	31.79
Wendell	2.59	1.82	2.19	1.00	2.41	4.48	5.85	3.20	0.95	2.44	3.52	4.47	34.92
Petersham (Harvard Forest)**	3.13	2.12	2.48	0.87	2.22	3.61	4.18	3.09	0.89	2.12	3.43	2.94	31.08
Petersham (Nichewaug)*	2.41	1.59	1.39	0.66	3.66	3.27	4.51	2.26	1.10	2.44	3.54	3.18	30.01
Pelham*	2.09	2.11	1.10	0.90	3.87	5.73	5.88	3.73	1.67	2.79	3.58	3.91	37.36
North New Salem*											3.04	3.63	
Quabbin Aqueduct Intake Works*											3.37	3.06	
New Salem*									1.12	2.94	3.39	4.06	
1941 Mean****	2.38	1.84	1.67	0.81	2.81	4.16	5.15	3.26	1.20	2.59	3.38	3.72	32.97
22-Year Mean****	3.49	2.92	3.57	4.07	3.54	4.71	4.18	4.05	4.77	3.15	4.06	3.33	45.84

1942

Administration Building*	3.50	1.33	5.08	1.29	3.34	4.71	4.98	1.72	4.29	4.37	7.32	5.62	47.55
Shutesbury	3.98	1.80	7.51	1.06	3.34	4.64	5.14	3.93	4.08	4.13	5.27	6.06	50.94
Wendell	3.83	1.99	7.47	1.31	2.62	4.45	5.41	2.21	4.02	4.06	5.34	5.95	48.66
Petersham (Harvard Forest)*	3.32	2.19	5.94	0.78	2.09	4.37	5.00	1.58	3.02	2.73	5.76	4.42	41.20
Petersham (Nichewaug)*	4.19	1.94	6.30	0.94	3.35	5.79	4.81	1.92	3.59	3.84	5.56	3.74	45.97
Pelham*	2.99	1.19	6.14	0.68	3.30	6.06	5.62	2.17	4.54	4.34	5.92	5.13	48.08
North New Salem*	3.64	2.05	8.07	1.15	3.23	4.35	5.40	2.20	3.60	3.94	5.93	6.18	49.74
Quabbin Aqueduct Intake Works*	3.99	2.14	7.33	1.00	2.54	4.33	4.14	1.96	3.73	3.43	5.57	5.19	45,35
South New Salem‡*	3.93	1.63	7.20	0.99	3.55	5.60	4.47	2.47	4.04	4.29	4.58	6.28	49.03
1942 Mean	3.71	1.81	6.78	1.02	3.04	4.92	5.00	2.24	3.88	3.90	5.69	5.40	47.39
23-Year Mean	3.50	2.87	3.71	3.93	3.52	4.72	4.22	3.97	4.73	3.18	4.14	3.42	45.91

1943

Administration Building*	2.79	1.61	3.34	3.11	6.21	3.12	7.03	3.90	1.44	4.19	6.49	0.76	43.99
Shutesbury	3.13	1.17	3.32	3.51	5.95	1.88	4.87	4.35	2.24	4.76	5.03	0.59	40.80
Wendell	2.79	1.59	3.93	3.54	6.67	2.14	4.65	2.39	2.54	4.22	6.25	0.61	41.32
Petersham (Harvard Forest)*	1.91	1.34	2.44	3.72	5.21	1.92	4.52	2.99	1.55	5.05	5.75	0.73	37.13
Petersham (Nichewaug)*	3.22	0.20	0.79	3.62	5.53	1.68	4.70	5.82	1.51	5.48	6.36	0.74	39.65
Pelham*	2.63	1.70	2.48	3.79	6.48	1.84	6.54	3.60	1.77	4.97	6.29	0.63	42.72
North New Salem*	2.63	0.72	3.25	3.77	5.94	2.63	4.84	2.98	1.96	6.04	5.70	0.69	41.15
Quabbin Aqueduct Intake Works*	2.35	1.11	2.02	1.66	4.75	1.62	4.58	4.19	1.49	5.29	5.80	0.76	35.62
South New Salem*	2.57	1.73	3.08	3.88	5.60	1.85	3.59	4.81	1.53	5.32	5.49	0.54	39.99
1943 Mean	2.67	1.24	2.73	3.40	5.82	2.08	5.04	3.89	1.78	5.04	5.91	0.67	40.27
24-Year Mean	3.46	2.80	3.67	3.91	3.62	4.61	4.25	3.96	4.61	3.26	4.21	3.31	45.67

* Station maintained by Metropolitan District Water Supply Commission.

** Station maintained by Metropolitan District Commission (after Dec. 15, 1941 by MDWSC)

*** Rainfall at West Ware not included in these figures because station was discontinued in June, 1940

****Omitting New Salem, No. New Salem and Quabbin Aqueduct Intake which were operating during part of year 1941.
Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

‡ Station moved from New Salem to South New Salem on October 19, 1942.

MONTHLY RAINFALL IN INCHES AT STATIONS OF THE SWIFT WATERSHED

1944

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Administration Building*	1.05	1.88	4.28	4.81	1.40	7.92	1.72	1.58	7.08	2.53	5.12	3.03	42.40
Shutesbury	1.54	2.24	4.75	3.58	1.49	7.72	4.80	2.44	6.18	2.40	4.52	2.99	44.65
Wendell	1.54	2.63	4.99	3.75	1.51	6.73	5.97	1.38	6.65	2.13	4.21	2.79	44.28
Petersham (Harvard Forest)*	1.13	1.83	4.34	3.59	0.91	9.48	4.28	0.63	6.40	1.49	3.54	2.61	40.23
Petersham (Nichewaug)*	1.34	1.57	4.32	4.61	1.43	3.08	3.62	1.97	7.01	1.96	3.79	2.33	42.03
Pelham*	1.26	1.88	4.04	4.50	1.84	7.72	4.01	2.51	7.44	2.40	4.51	2.81	44.92
North New Salem*	1.10	2.57	4.55	3.64	1.30	8.44	3.81	0.89	5.67	2.18	4.04	2.74	40.93
Quabbin Aqueduct Intake Works*	1.37	1.91	4.09	4.69	1.45	8.25	2.44	1.84	6.43	2.12‡	4.19‡	2.75	41.53
South New Salem*	1.28	2.29	4.93	4.44	1.00	8.44	4.66	1.93	5.52	1.91	3.76	2.20	42.36
1944 Mean	1.29	2.09	4.47	4.18	1.37	8.09	3.92	1.69	6.49	2.12	4.19	2.69	42.59
25-Year Mean	3.37	2.78	3.70	3.92	3.53	4.75	4.24	3.87	4.69	3.21	4.21	3.28	45.55

1945

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Administration Building*	2.58	3.49	1.88	5.25	6.30	6.81	7.89	3.14	1.74	2.35	4.12	5.16	50.71
Shutesbury	3.27	4.24	1.60	6.04	6.58	10.34	8.11	2.83	4.02	2.93	4.62	4.56	59.14
Wendell	3.70	4.32	2.12	6.27	7.14	6.64	9.34	2.55	3.78	2.72	4.23	5.60	58.41
Petersham (Harvard Forest)*	1.59	3.95	1.70	4.90	5.29	7.72	6.03	3.20	3.09	2.59	3.68	4.13	47.87
Petersham (Nichewaug)*	2.89	2.92	1.50	5.31	6.70	9.17	8.01	3.09	1.60	2.85	3.96	4.55	52.55
Pelham*	2.49	3.87	1.80	6.55	7.43	10.12	7.70	3.31	3.00	3.11	4.28	4.08	57.74
North New Salem*	3.29	3.70	2.09	5.84	6.90	8.32	8.33	3.16	3.35	3.24	4.83	3.90	56.95
Quabbin Aqueduct Intake Works*	3,33	3.43	1.76	6.40	6.40	8.69	7.02	3.64	1.76	2.78	4.02	4.69	53.92
South New Salem*	2.29	—	1.86	6.32	6.48	10.24	7.01	2.98	2.95	2.83	3.86	4.45	51.27
1945 Mean	2.83	3.32	1.81	5.88	6.58	8.67	7.71	3.10	2.81	2.82	4.18	4.57	54.28
26-Year Mean	3.36	2.80	3.63	3.99	3.64	4.90	4.37	3.85	4.61	3.20	4.21	3.33	45.89

* Station maintained by Metropolitan District Water Supply Commission. Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

‡ Interpolated.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

Expenditures and Disbursements for the Period December 1, 1939, to June 30, 1945, Inclusive and From July 28, 1926, the Date of the Appointment of the Commission on Account of Metropolitan Water Supply Construction Fund

GENERAL OVERHEAD

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Administration, *Commissioners' Office:*							
Salaries, Commissioners'	$10,500.00	$10,500.00	$10,500.00	$10,844.10	$11,325.84	$6,244.80	$198,330.30
Salaries, Clerical	16,241.04	16,670.73	18,780.12	17,590.35	18,784.00	11,079.00	255,268.98
General Legal Expense	1,255.68	382.82	794.00	0.00	0.00	0.00	4,787.38
Furniture and Fixtures	283.94	0.00	0.00	0.00	0.00	0.00	6,859.68
Engineering Instruments	0.00	0.00	0.00	0.00	0.00	0.00	519.97
Rental of Equipment	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Rent and Upkeep	2,527.27	4,287.68	2,086.98	1,709.63	1,899.01	1,086.94	43,347.52
Automobile Purchase	735.38	267.50	0.00	0.00	0.00	0.00	3,920.81
Automobile Maintenance	344.79	940.24	357.67	275.03	143.95	109.05	6,027.27
Miscellaneous Expenses (undistributed)	1,359.64	1,662.73	452.82	98.43	98.12	149.96	27,454.17
Printing and Blueprinting	758.46	791.18	393.12	184.71	285.47	435.54	14,898.10
Stationery and Office Supplies	389.51	349.92	285.52	139.71	187.56	95.28	5,359.49
Advertising	659.85	760.72	829.99	0.00	71.70	71.60	15,079.17
Postage	333.00	295.00	148.00	184.00	176.00	107.00	3,520.13
Current Distributed Overhead							
P.W.A. General Overhead	7,666.06	2,477.69	0.00	0.00	0.00	0.00	15,721.35
Miscellaneous Expenses	34.45	197.74	0.00	0.00	0.00	0.00	232.19
Total Administration, Commissioners' Office	$43,089.07	$39,583.95	$34.628.22	$31,025.96	$32,971.65	$19,379.17	$601,331.51

GENERAL OVERHEAD (Continued)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
ENGINEERING, *Headquarters Office:*							
Salaries, Engineering	$40,373.05	$38,381.18	$62,296.76	$50,957.71	$55,747.70	$19,822.66	$1,257,038.67
Salaries, Clerical	16,314.15	20,605.90	24,614.04	19,958.97	18,034.15	8,198.73	241,999.29
Salaries, Engineering, Pension	0.00	1,225.00	1,470.00	1,470.00	1,470.00	857.50	6,492.50
General Consultant Expense	3,204.02	–833.32	0.00	681.39	2,036.53	0.00	123,366.27
General Legal Expense	0.00	0.00	0.00	0.00	0.00	0.00	53,160.29
Furniture and Fixtures	484.15	24.31	0.00	0.00	0.00	0.00	16,029.46
Laboratory Equipment	0.00	0.00	0.00	0.00	0.00	0.00	1,961.00
Laboratory Supplies	0.00	0.00	0.00	0.00	0.00	0.00	2,071.94
Rental of Equipment	0.00	0.00	0.00	0.00	0.00	0.00	3,370.02
Engineering Instruments	0.00	0.00	0.00	0.00	0.00	77.21	1,718.67
Rent and Upkeep of Boston Office	$11,245.58	$11,805.68	$7,791.24	$6,123.21	$6,202.85	$3,487.79	$182,809.19
Rent and Upkeep of Springfield Laboratory	0.00	0.00	0.00	0.00	0.00	0.00	3,950.54
Automobile Purchase	0.00	267.50	0.00	0.00	0.00	0.00	3,872.12
Automobile Maintenance	264.85	759.95	389.59	183.87	197.09	153.39	6,689.88
Special Experiments	0.00	0.00	0.00	0.00	0.00	0.00	2,304.63
Miscellaneous Expense (undistributed)	757.35	601.82	478.78	369.95	391.46	421.05	27,415.95
Printing and Blueprinting	400.52	395.25	195.42	921.02	759.24	385.59	20,234.64
Stationery and Office Supplies	489.74	564.32	460.96	234.32	356.99	211.81	9,567.81
Postage	711.00	306.60	90.00	108.00	122.50	64.35	4,712.53
Medical and Surgical Services	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Current Distributed Overhead							
P.W.A. General Overhead	96,255.92	33,469.47	0.00	0.00	0.00	0.00	239,052.88
Miscellaneous Expenses	7,438.06	17,175.96	0.00	0.00	0.00	0.00	24,614.02
Transfer to Sewerage	0.00	0.00	–2,499.93	0.00	0.00	0.00	—2,499.93
Total Engineering, Headquarters Office	$177,938.39	$124,749.62	$95,286.86	$81,008.44	$85,318.51	$33,680.08	$2,229,937.37
UNDISTRIBUTED		102.72	—102.72				
TOTAL GENERAL OVERHEAD	$221,027.46	$164,436.29	$129,812.36	$112,034.40	$118,290.16	$53,059.25	$2,831,268.88

DISTRIBUTION OF GENERAL OVERHEAD

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
ADMINISTRATION, *Commissioners' Office:*							
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$3,867.97	$5,954.30	$4,054.97	$6,183.47	$12,700.68	$2,223.15	$124,825.39
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	126.76	0.00	0.00	0.00	0.00	0.00	129.21
Coldbrook-Swift Tunnel section of Quabbin Aqueduct (except PWA)	106.17	205.77	128.12	421.95	639.65	139.43	31,511.71
Coldbrook-Swift Tunnel section of Quabbin Aqueduct (PWA)	173.20	0.00	0.00	0.00	0.00	0.00	173.20
Quabbin Reservoir (PWA)	815.51	228.08	0.00	0.00	0.00	0.00	1,589.11
Quabbin Reservoir (except PWA)	23,758.94	19,012.55	22,522.18	9,580.82	12,324.80	10,608.39	277,243.54
Winsor Dam (except PWA)	7,477.60	11,541.00	1,291.63	688.78	880.34	1,190.98	76,051.55
Winsor Dam (PWA)	147.34	46.50	0.00	0.00	0.00	0.00	193.84
Quabbin Dike	201.71	254.67	173.16	9.31	837.48	65.84	30,196.44
Southern Sudbury Emergency Supply	0.00	0.00	0.00	0.00	0.00	0.00	4,298.45
Special Investigations	0.00	0.00	0.00	0.00	0.00	0.00	8,690.28
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	$10.62	$0.00	$4,141.54	$5,801.86	$2,337.69	$2,103.09	$15,699.14
Weston Aqueduct Siphons (PWA)	0.00	0.00	0.00	0.00	0.00	0.00	423.11
Hultman Aqueduct (Supply Section) (PWA)	2,173.03	1,200.15	0.00	0.00	0.00	0.00	6,771.17
Hultman Aqueduct (Supply Section) (except PWA)	0.00	0.93	1,153.11	3,025.03	491.28	11.62	4,681.97
Hultman Aqueduct (Distribution Section) (PWA)	3,915.68	1,138.15	0.00	0.00	0.00	0.00	5,976.56
Hultman Aqueduct (Distribution Section) (except PWA)	0.00	1.85	1,163.51	5,314.74	2,759.73	8,036.67	12,276.50
Spot Pond By-Pass (PWA)	144.50	0.00	0.00	0.00	0.00	0.00	430.30
Enlargement of Fells Reservoir (PWA)	170.04	0.00	0.00	0.00	0.00	0.00	170.04
Total Administration, Commissioner's Office	$43,089.07	$39,583.95	$34,628.22	$31,025.96	$32,971.65	$19,379.17	$601,331.51

DISTRIBUTION OF GENERAL OVERHEAD (Continued)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
ENGINEERING, *Headquarters Office:*							
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$10,477.37*	$12,099.74	$10,455.47	$16,145.01	$32,659.19	$3,866.48	$431,881.00
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	689.06	269.55	0.00	0.00	0.00	0.00	1,622.20
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	222.73	500.03	330.35	1,101.71	1,630.44	242.50	118,151.77
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	289.31	2.72	0.00	0.00	0.00	0.00	292.03
Quabbin Reservoir (PWA)	7,555.46	3,943.13	0.00	0.00	0.00	0.00	16,854.90
Quabbin Reservoir (except PWA)	51,109.96	38,443.01	58,072.19	25,015.42	32,790.01	18,449.95	945,748.24
Winsor Dam (except PWA)	15,737.88	28,738.83	3,330.40	1,798.38	2,329.82	2,071.32	231,323.77
Winsor Dam (PWA)	5,318.44	1,015.14	0.00	0.00	0.00	0.00	6,333.58
Quabbin Dike	984.94	889.35	446.44	24.29	2,178.84	114.51	111,356.15
Special Investigations	0.00	0.00	0.00	0.00	0.00	0.00	19,863.79
Southern Sudbury Emergency Supply . .	0.00	0.00	0.00	0.00	0.00	0.00	33,407.97
Wachusetts Watershed Protection and Elimination of Pollution (except PWA)	2,600.98*	2,163.73	10,678.71	15,148.60	5,880.56	3,657.65	43,282.08
Wachusett Watershed Protection (PWA) . .	20.91	430.04	0.00	0.00	0.00	0.00	450.95
Weston Aqueduct Siphons (PWA) . . .	656.44	0.00	0.00	0.00	0.00	0.00	5,722.73
Hultman Aqueduct (Supply Section) (PWA)	37,493.00	14,666.11	0.00	0.00	0.00	0.00	114,472.88
Hultman Aqueduct (Supply Section) (except PWA)	0.00	2,753.64	2,973.25	7,898.33	1,052.69	20.21	14,698.12
Hultman Aqueduct (Distribution Section) (PWA)	35,293.00	11,388.57	0.00	0.00	0.00	0.00	72,793.01
Hultman Aqueduct (Distribution Section) (except PWA)	$548.61	$5,691.82	$9,000.05	$13,876.70	$6,796.96	$5,257.46	$41,171.60
Spot Pond By-Pass (PWA)	5,062.85	1,673.43	0.00	0.00	0.00	0.00	13,611.66
Enlargement of Fells Reservoir (PWA) . .	3,877.45	80.78	0.00	0.00	0.00	0.00	6,898.94
Total Engineering, Headquarters Office .	$177,938.39	$124,749.62	$95,286.86	$81,008.44	$85,318.51	$33,680.08	$2,229,937.37

* Town of Rutland Sewer (WPA) (200.39) transferred to Wachusett Watershed Protection.

WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT

(EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office	$3,867.97	$5,954.29	$4,054.97	$6,183.47	$12,700.68	$2,223.15	$124,825.39
Engineering, Headquarters Office	10,477.37	12,099.74	10,455.47	16,145.01	32,659.19	3,866.48	431,881.00
Total General Overhead	$14,345.34	$18,054.03	$14,510.44	$22,328.48	$45,359.87	$6,089.63	$556,706.39
ENGINEERING:							
Total Except the Following Listed Items	$243.13	$164.69	$364.13	$135.11	$9.06	$0.00	$41,344.64
Salaries, Engineering and Clerical	8,138.32	10,006.63	3,997.45	2,012.76	2,222.49	330.95	433,640.30
Consultant Expense	3.00	625.00	300.00	243.44	231.55	206.04	10,944.28
Labor	658.29	2,273.07	362.12	111.21	1,029.55	29.12	9,301.36
Miscellaneous Expense (undistributed)	358.06	125.52	137.21	22.61	389.19	2.86	11,661.98
Printing and Blueprinting	18.14	20.77	12.43	16.45	0.39	20.31	1,332.65
Stationery and Office Supplies	61.91	52.49	32.93	10.67	19.37	1.30	3,331.69
Postage	12.11	12.60	10.10	7.94	3.70	4.00	525.61
Automobile Maintenance	600.97	1,277.55	1,010.44	178.48	270.36	200.43	19,793.31
Rent and Upkeep	1,764.42	582.16	494.59	233.06	25.30	5.70	24,001.34
Tools and Equipment	535.02	40.20	67.52	0.00	0.00	3.80	667.92
Total Engineering	$12,393.37	$15,180.68	$6,788.92	$2,971.73	$4,200.96	$804.51	$556,545.08
REAL ESTATE—*General Construction*:							
Total Except the following listed Items	847.85	399.00	7.30	$0.00	$1.74	$0.00	$145,819.04
Police Protection—labor	3,556.33	644.38	4,433.90	155.25	70.68	0.00	9,665.29
Special Agents, Salaries	0.00	0.00	1,158.39	515.55	1,537.65	821.40	16,981.99
Total Real Estate	$4,404.18	$1,043.38	$5,609.59	$670.80	$1,610.07	$821.40	$172,466.32

WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
WARE WATERSHED:							
Total Except the Following Listed Items	$13,942.01	$6,461.01	$7,226.94	$22,826.93	$499.22	$0.00	$336,860.08
Salaries, Engineering and Clerical	10,966.89	10,312.95	13,550.78	5,671.17	2,308.35	631.88	197,207.53
Legal and Expert Expense	2,861.66	1,272.52	1,521.32	1,765.74	2,986.16	1,692.80	41,869.71
Consultant Expense	0.00	0.00	0.00	0.00	199.91	28.30	991.91
Labor	10,591.80	2,693.58	4,622.35	1,218.09	6,312.07	2,197.15	48,056.89
Automobile Maintenance	2,285.34	2,158.17	2,181.97	249.80	471.05	511.07	15,163.70
Miscellaneous Expense (undistributed)	597.10	601.46	900.88	33.03	205.89	196.97	8,759.55
Printing and Blueprinting	69.79	53.97	73.87	34.46	18.61	2.09	1,155.43
Stationery and Office Supplies	119.63	118.62	82.83	43.81	21.40	1.00	964.99
Postage	27.92	35.47	25.88	13.75	7.28	3.00	204.82
Tools and Equipment	217.61	147.63	63.56	6.85	0.00	3.80	519.90
Engineering Instruments	5.15	5.43	0.00	0.00	0.00	3.54	452.17
Purchases and Settlements (including Certificate of Judgment)	38,817.97	69,897.27	8,293.45	15,846.19	93,151.37	45,775.00	1,689,080.19
Taxes	22,141.34	13,454.11	14,102.33	11,687.79	14,463.11	2,320.33	134,505.53
Maintenance of Real Estate	390.13	365.76	544.61	8.61	93.85	5.88	12,909.44
Fire Stops and Fire Access Roads Labor	7,105.59	4,468.38	1,805.43	187.53	209.61	272.00	38,056.10
Total Ware Watershed	$110,139.93	$112,046.33	$54,996.20	$59,593.75	$120,947.97	$53,644.81	$2,526,757.94
WARE DIVERSION DAMAGES:							
PERMANENT CONSTRUCTION-CONSTRUCTION CONTRACTS:	3,780.30	$0.00	$0.00	$0.00	$0.00	$0.00	$1,429,557.92
PERMANENT CONSTRUCTION-EXCEPT CONSTRUCTION CONTRACTS:	$0.00	$0.00	$1,257.16	$0.00	$0.00	0.00	$9,643,641.87
Total Except the Following Listed Items	$373.30	$190.35	$44.23	$0.00	0.00	$690.00	$20,502.99
Labor	1,536.09	93.83	322.21	163.59	117.83	0.00	10,161.79
Maintenance of Partially Completed Structures	5,203.49	6,863.72	5,462.47	996.29	0.00	0.00	42,476.41
Maintenance of Grounds	1,212.18	1,943.86	2,227.62	62.58	0.00	0.00	11,102.98
Install Equipment	95.00	1,306.98	581.73	.00	0.00	0.00	113,784.44
Sub Total Except Construction Contracts	$8,420.06	$10,398.74	$8,638.26	$1,222.46	$117.83	$690.00	$198,028.61
Total Permanent Construction	$8,420.06	$10,398.74	$9,895.42	$1,222.46	$117.83	$690.00	$9,841,670.48
Total Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$153,483.18	$156,723.16	$91,800.57	$86,787.22	$172,236.70	$62,050.35	$15,083,704.13

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD	$815.82	$269.55	$0.00	$0.00	$0.00	$0.00	$1,751.41
ENGINEERING	1,811.76	917.71	569.31	0.00	0.00	0.00	10,144.23
CONSTRUCTION CONTRACT 64	8,251.15	0.00	0.00	0.00	0.00	0.00	82,511.51
CONSTRUCTION CONTRACT 101	78.73	0.00	0.00	0.00	0.00	0.00	78.73
CONSTRUCTION CONTRACT 109	0.00	6,034.22	0.00	0.00	0.00	0.00	6,034.22
CONSTRUCTION CONTRACT 112	2,979.15	3,758.01	0.00	0.00	0.00	0.00	6,737.16
OTHER PERMANENT CONSTRUCTION	38.93	15.67	149.89	0.00	0.00	0.00	274.65
Total Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (PWA only)	$13,975.54	$10,995.16	$719.20	$0.00	$0.00	$0.00	$107,531.91
TOTAL WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT	$167,458.72	$167,718.32	$92,519.77	$86,787.22	$172,236.70	$62,050.35	$15,191,236.04

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office	$106.17	$205.78	$128.12	421.95	$639.65	$139.43	$31,511.71
Engineering, Headquarters Office	222.73	500.03	330.35	1,101.71	1,630.44	242.50	118,151.77
Total General Overhead	$328.90	$705.81	$458.47	$1,523.66	$2,270.09	$381.93	$149,663.48
ENGINEERING:							
Total Except the Following Listed Items	$279.70	$1,007.83	$352.36	$54.15	$21.41	$0.00	$44,378.19
Salaries, Engineering and Clerical	821.00	1,180.79	1,147.21	3,859.48	5,213.45	290.30	281,799.28
Installed Equipment	0.00	0.00	0.00	0.00	0.00	315.41	315.41
Miscellaneous Expense (undistributed)	28.06	73.81	35.19	4.98	9.80	0.50	8,482.39
Automobile Maintenance	179.00	265.82	317.98	90.47	178.18	13.85	19,286.20
Labor	719.70	292.42	51.29	155.62	955.73	16.10	5,133.20
Total Engineering	$2,027.46	$2,820.67	$1,904.03	$4,164.70	$6,378.57	$636.16	$359,394.67
REAL ESTATE—GENERAL CNSTRUCTION	32.50	$6.42	$5.35	$0.00	$0.00	$0.00	$27,876.13
COLDBROOK-SWIFT DAMAGES:	$0.00	$298.75	$0.00	$0.00	$0.00	0.00	$8,668.18
PERMANENT CONSTRUCTION:	$438.26	$412.06	$505 15	$67.83	$0.00	$0.00	$4,874,523.66
Total Coldbrook-Swift Tunnel Section (Except PWA)	$2,827.12	$4,243.71	$2,873.00	$5,756.19	$8,648.66	$1,018.09	$5,420,126.12

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Total Expenditure	$2,302.72	$2.72	$0.00	$0.00	$0.00	$0.00	$2,305.44
TOTAL COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT	$5,129.84	$4,246.43	$2,873.00	$5,756.19	$8,648.66	$1,018.09	$5,422,431.56

QUABBIN RESERVOIR (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	$8,370.97	$4,171.21	$0.00	$0.00	$0.00	$0.00	$18,444.01
ENGINEERING:							
Total except the Following Listed Items	$2,973.13	$3,408.01	$3,273.59	$0.00	$0.00	$0.00	$19,811.44
Salaries, Engineering and Clerical	21,165.26	5,902.51	252.94	0.00	0.00	0.00	100,992.82
Labor	6,252.12	1,813.79	48.00	0.00	0.00	0.00	15,255.86
Total Engineering	$30,390.51	$11,124.31	$3,574.53	$0.00	$0.00	$0.00	$136,060.12
PERMANENT CONSTRUCTION:							
Contracts 61, 62, 63, 72	$96,945.52	$0.00	$0.00	$0.00	$0.00	$0.00	$1,312,873.74
Contract 66	40,956.14	0.00	0.00	0.00	0.00	0.00	188,965.86
Contract 82	62,292.45	0.00	0.00	0.00	0.00	0.00	228,550.64
Contract 93	20,194.61	0.00	0.00	0.00	0.00	0.00	25,102.08
Contract 101	93.06	0.00	0.00	0.00	0.00	0.00	93.06
Contract 103	2,911.95	10,549.05	0.00	0.00	0.00	0.00	13,461.00
Contract 106	27,433.36	0.00	0.00	0.00	0.00	0.00	27,433.36
Contract 107	0.00	72,477.06	0.00	0.00	0.00	0.00	72,477.06
Contract 108	7,672.50	10,855.77	0.00	0.00	0.00	0.00	18,528.27
Contract 109	0.00	9,969.60	0.00	0.00	0.00	0.00	9,969.60
Contract 116	0.00	10,871.36	0.00	0.00	0.00	0.00	10,871.36
Contract 122	0.00	4,567.00	0.00	0.00	0.00	0.00	4,567.00
Contract 123B	0.00	381.00	0.00	0.00	0.00	0.00	381.00
Contract 124	0.00	15,142.00	0.00	0.00	0.00	0.00	15,142.00
Other Permanent Construction	0.00	0.00	1,163.36	0.00	0.00	0.00	3,131.23
Total Permanent Construction	258,499.59	134,812.84	1,163.36	0.00	0.00	0.00	1,931,547.26
Total Quabbin Reservoir (PWA only)	297,261.07	150,108.36	4,737.89	0.00	0.00	0.00	2,086,051.39

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioner's Office	$23,758.94	$19,012.55	$22,522.18	$9,580.82	$12,324.80	$10,608.39	$277,243.54
Engineering, Headquarters Office	51,109.96	38,443.01	58,072.19	25,015.42	32,790.01	18,449.95	945,748.24
Total General Overhead	$74,868.90	$57,455.56	$80,594.37	$34,596.24	$45,114.81	$29,058.34	$1,222,991.78
ENGINEERING:							
Salaries, Engineering and Clerical	$46,364.70	$47,480.32	$33,383.69	$6,230.06	$13,269.35	$7,766.73	$769,613.12
Consultant Expenses	302.88	1,889.14	939.57	730.31	701.52	702.99	12,010.14
Labor	21,129.75	14,701.36	12,076.70	2,242.64	10,332.09	3,251.19	123,210.49
Tools and Equipment	1,461.26	987.04	171.50	80.83	79.60	42.70	3,478.43
Rent and Upkeep	6,960.95	5,921.29	5,786.67	3,093.70	48.41	31.99	45,666.01
Medical and Surgical Service	103.81	106.99	31.97	46.53	17.00	59.00	354.00
Automobile Maintenance	7,219.39	6,739.88	4,848.31	10.86	1,427.84	851.87	61,428.74
Miscellaneous Expense (undistributed)	2,980.16	1,886.65	947.39	349.32	818.34	617.53	22,167.63
Printing and Blueprinting	188.78	90.99	64.51	8.70	40.66	4.52	4,080.12
Stationery and Office Supplies	726.98	613.46	203.55	57.51	39.96	15.46	10,531.28
Postage	226.62	184.00	85.50	101.00	45.00	20.00	2,917.34
Labor on Automobiles and Mechanical Equipment	869.99	900.00	606.43	204.47	777.70	273.12	3,776.71
Maintenance of Mechanical Equipment	1,421.83	775.11	505.42	169.45	550.36	26.98	3,877.40
All Other Items	12,574.71	9,412.52	3,938.18	190.23	197.80	0.00	100,535.54
Total Engineering	$102,531.81	$91,688.75	$63,589.39	13,515.61	$28,345.63	$13,664.08	$1,163,646.95
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:							
Legal and Expert Expense	$2,608.92	$1,229.95	$633.28	$514.20	$800.66	$325.90	$193,179.35
Labor	3,087.76	444.62	266.63	98.04	1,315.38	76.34	31,906.70
Printing and Blueprinting	76.80	27.22	23.66	2.83	15.13	18.62	1,831.95
Taxes	29,484.81	17,531.36	18,113.02	16,999.38	16,068.16	79.56	575,205.00
Fire Protection Labor	38,622.02	4,469.90	1,510.86	49.07	41.40	34.75	78,904.24
Renting Agents Salaries	1,192.04	2,787.99	347.02	18.83	62.10	20.70	36,122.08
All Other Items	63,462.60	22,233.44	22,172.19	2,468.75	12,140.35	0.00	8,173,067.99
Sub Total Real Estate—Except Awards by Court Decree	$138,534.95	$48,724.48	$43,066.66	20,151.10	$30,443.18	$555.87	$9,909,217.31

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:							
Total Except the following listed items	$304.53	$0.00	$0.00	$0.00	$0.00	$0.00	$73,336.97
Legal Expense	3,571.15	150.00	0.00	0.00	0.00	0.00	4,431.88
Payments Under Certificates of Judgment	36,721.90	0.00	0.00	0.00	0.00	510.00	240,106.57
Sub Total Real Estate—Board of Referees	$40,597.58	$150.00	$0.00	$0.00	$0.00	$510.00	$317,875.42
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:							
Total Except the following listed items	$378.44	$387.05	$2.60	$14.00	$0.00	$0.00	$4,959.13
Consultant Expense	1,138.84	100.00	0.00	0.00	0.00	0.00	2,339.93
Payments under Certificates of Judgement	42,453.00	16,990.44	0.00	12,108.74	0.00	0.00	92,430.83
Settlements made by Attorney General on Petitions brought in Superior Court prior to judgment	16,956.84	39,484.85	24,730.00	600.00	0.00	0.00	81,771.69
Sub Total Real Estate—Jury Verdicts	$60,927.12	$56,962.34	$24,732.60	$12,722.74	$0.00	0.00	$181,501.58
Total Real Estate	240,059.65	$105,836.82	67,799.26	32,873.84	30,443.18	1,065.87	9,589,594.31
QUABBIN RESERVOIR DAMAGES—EXCEPT AWARDS BY COURT DECREE:							
Total Except Purchases and Settlements	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,195.65
Purchases and Settlements	9,862.33	328.00	0.00	0.00	0.00	0.00	68,136.33
Sub Total Quabbin Reservoir Damages—Except Awards by Court Decree	$9,862.33	$328.00	$0.00	$0.00	$0.00	$0.00	$71,331.98
QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—BOARD OF REFEREES:							
Legal Expense	$3,444.16	$152.01	$0.00	$0.00	$0.00	$0.00	$6,136.71
Expert and Other Witness Expense	0.00	20.00	0.00	0.00	0.00	0.00	960.00
Payments Under Certificates of Judgment	2,500.00	0.00	0.00	0.00	0.00	0.00	4,155.44
Sub Total Quabbin Reservoir Damages—Awards by Court Decree—Board of Referees	$5,944.16	$172.01	$0.00	$0.00	$0.00	$0.00	$11,252.15
QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:	$0.00	$195.65	$0.00	$0.00	$0.00	$0.00	$195.65
TOTAL QUABBIN RESERVOIR DAMAGES:	$15,806.49	$695.66	$0.00	$0.00	$0.00	$0.00	$82,779.78

SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE AND PAYMENTS TO COUNTIES:							
Total Except the Following Listed Items	$15,722.91	$1,089.82	$1,150.94	$226.79	$67.97	$0.00	$1,358,535.69
Salaries, Engineering and Clerical	15,305.09	5,339.85	2,884.31	933.58	2,032.42	937.33	138,075.04
Labor	5,373.30	1,136.25	1,344.73	692.64	504.71	394.32	18,792.77
Sub Total Swift Diversion Damages—Except Awards by Court Decree	$36,401.30	$7,565.92	$5,379.98	$1,853.01	$2,605.10	$1,331.65	$1,515,403.50
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) AWARDS BY COURT DECREE—JURY VERDICTS:							
Total Except the Following Listed Items	$243.72	$0.00	$175,000.00	$701.34	$0.00	$0.00	$185,738.70
Legal Expense	6,901.07	10,022.64	6,013.75	4,250.00	946.25	2,754.37	34,191.35
Consulting and Engineering Expert Expense	60,985.37	2,413.51	3,046.64	0.00	3,661.41	12,632.31	86,255.63
Expert and Other Witness Expense	27,839.78	0.00	0.00	0.00	0.00	14,512.93	48,702.71
Miscellaneous Expense (undistributed)	2,151.45	79.48	0.00	0.00	127.09	390.14	3,076.64
Printing and Blue printing	177.11	56.61	20.74	0.00	1,061.27	32.53	1,370.44
Automobile Maintenance	13.92	3.75	0.00	0.00	0.00	0.97	123.58
Sub Total Swift Diversion Damages Awards by Court Decree—Jury Verdicts	$95,312.42	$12,575.99	$184,081.13	$4,951.34	$5,796.02	$30,323.25	$359,459.05
SWIFT DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR REIMBURSEMENTS AND EXPENSES OF LITIGATION IN COUNTY COURTS:	$0.00	$4,307.05	$0.00	$0.00	$0.00	$0.00	$4,307.05
Total Swift Diversion Damages (Including Beaver Brook)	$134,713.72	$24,448.96	$189,461.11	$6,804.35	$8,401.12	$31,654.90	$1,879,169.60
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS TOWN OBLIGATION:							
Town of Enfield	$5,219.12	$3,338.10	$3,911.59	$3,351.95	$3,773.97	$908.30	$32,864.99
Town of Greenwich	2,016.45	1,353.73	460.66	993.44	99.20	1,246.00	13,354.33
Town of Prescott	1,152.71	187.39	285.00	861.92	11.02	6.00	5,862.09
Town of Dana	3,800.99	4,872.05	2,529.19	5,909.28	649.18	2,556.91	34,659.36
Sub Total Town Obligations	$12,189.27	$9,751.27	$7,186.44	$11,116.59	$4,533.37	$4,717.21	$86,740.77
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS LIQUIDATING EXPENSES:							
Total Except the Following Listed Items	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,372.48
Salaries Engineering	2,649.03	2,465.49	2,641.71	2,545.24	1,813.40	1,054.30	14,292.74
Legal and Expert Expense	1,068.57	255.00	0.00	0.00	0.00	0.00	3,244.43
Sub Total Liquidating Expenses	$3,717.60	$2,720.49	$2,641.71	$2,545.24	$1,813.40	$1,054.30	$18,909.65
Total, Quabbin Reservoir—Liquidation of Towns	$15,906.87	$12,471.76	$9,828.15	$13,661.83	$6,346.77	$5,771.51	$105,650.42

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
QUABBIN RESERVOIR — CEMETERIES — QUABBIN PARK CEMETERY CONSTRUCTION: (except PWA)							
Total Except the Following Listed Items	$2,248.63	$284.54	$321.49	$206.27	$0.00	$0.00	$38,798.45
Salaries, Engineering and Clerical	299.75	757.17	1,223.67	967.54	0.00	0.00	17,475.91
Labor	4,590.27	1,525.13	531.09	2,208.08	0.00	0.00	53,556.90
Maintenance of Grounds	4,698.10	5,357.00	6,782.03	3,890.84	0.00	0.00	42,546.89
Sub Total Quabbin Park Cemetery Construction	$11,836.75	$7,923.84	$8,858.28	$7,272.73	$0.00	$0.00	$152,378.15
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO QUABBIN PARK CEMETERY:							
Total Except the Following Listed Items	$493.08	$210.50	$87.08	$124.93	$0.00	$0.00	$24,779.11
Salaries, Engineering and Clerical	2,465.78	469.09	531.83	496.54	0.00	0.00	24,121.34
Removal and Reinterment of Bodies	1,261.79	434.31	263.09	600.26	0.00	0.00	33,351.02
Sub Total Removals to Quabbin Park Cemetery	$4,220.65	$1,113.90	$882.00	$1,221.73	$0.00	$0.00	$82,251.47
REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA TO CEMETERIES OTHER THAN QUABBIN PARK:	$309.45	$9.27	$13.00	$154.93	$0.00	$0.00	$31,132.70
Total Quabbin Reservoir—Cemeteries (except PWA)	$16,366.85	$9,047.01	$9,753.28	$8,649.39	$0.00	$0.00	$265,762.32
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:							
Completed Contracts	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$679,723.70
Contract 49	0.00	3,139.01	0.00	0.00	0.00	0.00	87,928.70
Contract 102	1,524.50	0.00	0.00	0.00	0.00	0.00	1,524.50
Contract 105			1,907.40	0.00	0.00	0.00	1,907.40
Contract 118				4,701.79	0.00	0.00	4,701.79
Contract 120	677.40	0.00	0.00	0.00	0.00	0.00	677.40
Contract 125		1,980.00	6,820.00	0.00	0.00	0.00	8,800.00
Sub Total Construction Contracts	$2,201.90	$5,119.01	$8,727.40	$4,701.79	$0.00	$0.00	$785,263.49

OTHER PERMANENT CONSTRUCTION — EXCEPT CLEARING:							
Total except Labor	$34.49	$2,005.20	$309.60	333.24	$109.72	$0.00	$9,976.53
Labor	357.50	1,305.28	362.29	64.54	0.00	0.00	6,482.30
Sub Total Other Permanent Construction—Except Clearing	$391.99	$3,310.48	$671.89	$397.78	$109.72	$0.00	$16,458.83
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:	$0.00	$0.00	$5.94	$0.00	$0.00	$0.00	$22,316.54
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:							
Compensation Payments to Employees Injured on Work	$1,051.44	$832.00	$112.00	$1,156.00	$636.00	$360.00	$46,529.11
All Other Items	126.43	—265.00	5.00	125.00	0.00	0.00	1,794,652.10
Sub Total 1936 Clearing Project	$1,177.87	$567.00	$117.00	$1,281.00	$636.00	$360.00	$1,841,181.21
OTHER PERMANENT CONSTRUCTION—WPA CLEARING PROJECT:	$0.00	$3,387.76	$0.00	0.00	$0.00	$0.00	$3,387.76
OTHER PERMANENT CONSTRUCTION—RESERVOIR CLEARING NOT INCLUDING 1936 CLEARING PROJECT OR WPA CLEARING PROJECT:							
Total Except the Following Listed Items	$192.62	$48.51	$178.10	$73.29	$303.29	$26.86	$3,870.46
Salaries, Engineering	483.15	871.07	1,056.02	1,275.35	2,114.02	1,135.03	7,708.27
Labor	31,567.85	24,986.19	17,776.03	22,387.53	35,223.71	15,546.94	218,965.17
Sub Total Reservoir Clearing, Not Including 1936 Clearing Project or WPA	$32,243.62	$25,905.77	$19,010.15	$23,736.17	$37,641.02	$16,708.83	$230,543.90
Total Quabbin Reservoir Permanent Construction	$36,015.38	$38,290.02	$28,532.38	$30,116.74	$38,386.74	$17,068.83	$2,899,151.73
HIGHWAY AND PUBLIC UTILITY RELOCATION:							
Total Except Labor	$31.36	$109.02	$504.89	$129.45	$0.00	$0.00	$1,357,191.50
Labor	3,468.46	3,164,15	7,660.90	7.94	0.00	0.00	32,615.97
Total Highway and Public Utility Relocation	$3,499.82	$3,273.17	$8,165.79	$137.39	$0.00	$0.00	$1,389,807.47
QUABBIN RESERVOIR WATERSHED — REFORESTATION NURSERIES:							
Total Except the Following Listed Items	$2,363.71	$1,423.49	$147.39	$5.50	$12.94	$0.00	$16,296.20
Salaries, Engineering and Clerical	1,312.17	1,247.23	759.00	557.95	394.50	386.21	8,964.88
Labor	18,218.64	14,212.43	19,404.04	5,225.18	3,029.40	2,095.82	110,332.45
Sub Total Reforestation—Nurseries	$21,894.52	$16,883.15	$20,310.43	$5,788.63	$3,436.84	$2,482.03	$135,593.53

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
QUABBIN RESERVOIR WATERSHED — REFORESTATION WATERSHED PLANTING:							
Total Except the following Listed Items . .	$581.05	$227.88	$83.00	$0.00	$0.00	$14.29	$4,808.62
Salaries, Engineering and Clerical . . .	1,422.50	1,040.85	1,030.76	175.60	779.50	974.40	7,061.14
Labor	25,360.79	19,865.44	16,927.16	3,022.02	6,088.09	6,175.62	101,487.76
Sub Total Reforestation—Watershed Planting	$27,364.34	$21,134.17	$18,040.92	$3,197.62	$6,867.59	$7,164.31	$113,357.52
QUABBIN RESERVOIR WATERSHED — REFORESTATION FIRE STOPS AND FIRE ACCESS ROADS:							
Total Except Labor	$3,766.87	$148.63	$622.24	$149.15	$36.75	$0.00	$20,125.32
Labor	16,469.94	631.25	5,642.59	–55.92	335.17	0.00	61,739.85
Sub Total Reforestation—Fire Stops and Fire Access Roads	$20,236.81	$779.88	$6,264.83	$93.23	$371.92	$0.00	$81,865.17
QUABBIN RESERVOIR WATERSHED—FENCING OF WATERSHED PROPERTY:	$557.90	$283.78	$182.11	$13.71	$444.83	$4.33	$6,505.63
QUABBIN RESERVOIR WATERSHED—OTHER FORESTRY AND HURRICANE CLEARING:							
Total Except the Following Listed Items . .	$55.55	$10.80	$0.00	$57.00	$13.00	$0.00	$6,552.75
Salaries, Engineering	928.63	507.24	288.46	118.25	7.50	0.00	2,769.03
Labor	2,978.87	0.00	0.00	1,689.74	20.76	0.00	41,963.28
Sub Total Other Forestry and Hurricane Clearing	$3,963.05	$518.04	$288.46	$1,864.99	$41.26	$0.00	$51,285.06
QUABBIN RESERVOIR WATERSHED — PATROL EQUIPMENT:	$3,722.82	$1,073.87	$1,812.94	$164.36	$0.00	$0.00	$6,773.99
Total Quabbin Reservoir Watershed . . .	$77,739.44	$40,672.89	$46,899.69	$11,122.54	$11,162.44	$9,650.67	$395,380.90
Total Quabbin Reservoir, not Including Winsor Dam and Quabbin Dike (except PWA) . .	$717,508.93	$383,880.60	$504,623.42	$151,477.93	$168,200.69	$107,934.20	$18,993,935.26
TOTAL QUABBIN RESERVOIR, NOT INCLUDING WINSOR DAM AND QUABBIN DIKE	$1,014,770.00	$533,988.96	$509,361.31	$151,477.93	$168,200.69	$107,934.20	$21,079,986.65

WINSOR DAM (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office . . .	$7,477.60	$11,541.00	$1,291.63	$688.78	$880.34	$1,190.98	$76,051.55
Engineering, Headquarters Office . . .	15,737.88	28,738.83	3,330.40	1,798.38	2,329.82	2,071.32	231,323.77
Total General Overhead	$23,215.48	$40,279.83	$4,622.03	$2,487.16	$3,210.16	$3,262.30	$307,375.32
ENGINEERING:							
Total Except the Following Listed Items . .	$3,239.98	$452.32	$46.44	$29.83	$31.59	$179.33	$110,199.45
Salaries, Engineering and Clerical . . .	37,332.78	4,479.58	1,536.68	609.05	558.60	275.00	387,764.94
Labor	9,280.10	2,209.57	7.25	113.54	0.00	0.00	68,463.03
Total Engineering	$49,852.86	$7,141.47	$1,590.37	$752.42	$590.19	$454.33	$566,427.42
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:							
Completed Contracts	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,411,543.40
Contract 52	242,107.96	200,000.00	0.00	0.00	0.00	0.00	2,426,926.18
Contract 119			4,588.00	0.00	0.00	0.00	4,588.00
Sub Total Construction Contracts . .	$242,107.96	$200,000.00	$4,588.00	$0.00	$0.00	$0.00	$4,843,057.58
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:							
Total Except the Following Listed Items . .	$463.24	$141.53	$173.78	$3.76	$14.29	$0.00	$19,438.26
Labor	0.00	0.00	2,991.84	94.58	0.00	0.00	9,268.58
Installed Equipment	2,064.49	51.59	0.00	0.00	16.84	0.00	46,004.21
Sub Total Except Construction Contracts	$2,527.73	$193.12	$3,165.62	$98.34	$31.13	$0.00	$74,711.05
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTION FOR BREACH OF CONTRACT:							
Total Except the Following Listed Items . .	$131.36	$18,184.78	$12,107.17	$1,351.18	$271.26	$0.00	$32,045.75
Legal Expense	0.00	5,084.20	1,436.49	5,870.49	7,906.04	5,000.00	25,297.22
Miscellaneous Expense (Undistributed) . .	0.00	941.44	180.96	1.95	0.30	1.38	1,126.03
Sub Total Permanent Construction Awards	$131.36	$24,210.42	$13,724.62	$7,223.62	$8,177.60	$5,001.38	$58,469.00
Total Permanent Construction . . .	244,767.05	224,403.54	21,478.24	7,321.96	8,208.73	5,001.38	4,976,237.63
Total Winsor Dam (Except PWA) . .	317,835.39	271,824.84	27,690.64	10,561.54	12,009.08	8,718.01	5,850,040.37

WINSOR DAM (PWA ONLY)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	$5,465.78	$1,061.64	$0.00	$0.00	$0.00	$0.00	$6,527.42
ENGINEERING:							
Total Except the Following Listed Items	$241.98	$104.81	$0.00	$0.00	$0.00	$0.00	$346.79
Salaries, Engineering and Clerical	719.73	1,668.14	0.00	0.00	0.00	0.00	2,387.87
Legal Expense			1,474.40	0.00	0.00	0.00	1,474.40
Total Engineering	$961.71	$1,772.95	$1,474.40	$0.00	$0.00	$0.00	$4,209.06
CONSTRUCTION CONTRACTS:							
Contract 111		$48,060.36	$0.00	$0.00	$0.00	$0.00	$48,060.36
Contract 121	$1,774.80	690.20	0.00	0.00	0.00	0.00	2,465.00
Total Construction Contracts	$11,774.80	$48,750.56	$0.00	$0.00	$0.00	$0.00	$50,525.36
Total Winsor Dam (PWA only)	$8,202.29	$51,585.15	$1,474.40	$0.00	$0.00	$0.00	$61,261.84
TOTAL WINSOR DAM	$326,037.68	$323,409.99	$29,165.04	$10,561.54	$12,009.08	$8,718.01	$5,911,302.21

QUABBIN DIKE

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office	$201.71	$254.67	$173.16	$9.31	$837.48	$65.84	$30,196.44
Engineering, Headquarters Office	984.94	889.35	446.44	24.29	2,178.84	114.51	111,356.15
Total General Overhead	$1,186.65	$1,144.02	$619.60	$33.60	$3,016.32	$180.35	$141,552.59
ENGINEERING:							
Total Except the Following Listed Items	$700.93	$217.64	$45.04	$12.87	$6.81	$0.00	$45,135.26
Salaries, Engineering and Clerical	555.24	96.62	50.09	0.00	56.76	0.00	176,214.80
Labor	2,893.31	1,079.74	.99	0.00	0.00	0.00	42,424.64
Total Engineering	$4,149.48	$1,394.00	$96.12	$12.87	$63.57	$0.00	$263,774.70
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,455,889.88
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:							
Total Except the Following Listed Items	$0.00	$12.72	$0.00	$0.00	$11.09	$0.00	$4,204.75
Labor	0.00	4.50	2,608.98	94.35	514.36	0.00	18,379.67
Maintenance of Grounds	36.15	401.30	549.04	8.69	0.00	0.00	1,278.79
Sub Total Except Construction Contracts	$36.15	$418.52	$3,158.02	$103.04	$525.45	$0.00	$23,863.21

QUABBIN DIKE

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Permanent Construction—Defense Against Awards by Court Decree—Actions for Breach of Contract:							
Total Except the Following Listed Items . .	$263.21	$1,117.71	$3.96	$0.00	$499.98	$3.50	$2,415.51
Salaries, Engineering and Clerical . . .	$2,376.36	127.57	0.00	144.00	16.00	0.00	3,431.67
Consultant Expense	797.50	2,565.18	10.00	0.00	0.00	0.00	3,600.06
Legal Expense	347.50	363.60	0.00	0.00	7,250.00	300.00	9,464.70
Sub Total Defense Against Awards by Court Decree	$3,784.57	$4,174.06	$13.96	$144.00	$7,765.98	$303.50	$18,911.94
Total Permanent Construction . . .	3,820.72	4,592.58	3,171.98	247.04	8,291.43	303.50	2,498,665.03
TOTAL QUABBIN DIKE . . .	9,156.85	7,130.60	3,887.70	293.51	11,371.32	483.85	2,903,992.32

SPECIAL INVESTIGATIONS

Total Expenditure	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$149,609.63

SOUTHERN SUDBURY EMERGENCY SUPPLY

Total Expenditure	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$638,533.83

WACHUSETT WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

General Overhead:							
Administration, Commissioners' Office . .	$10.62	$0.00	$4.141.54	$5,801.86	$2,337.69	$2,103.09	$15,699.14
Engineering, Headquarters Office . . .	2,600.98	2,163.73	10,678.71	15,148.60	5,880.56	3,657.65	43,282.08
Total General Overhead	$ 2,611.60	$2,163.73	$14,820.25	$20,950.46	$8,218.25	$5,760.74	$58,981.22
Engineering—Except WPA Projects: . .	$627.91	$619.23	$477.36	$65.98	$0.00	$0.00	$36,037.30
Real Estate:							
Legal Expense			$310.60	$0.00	$0.00	$0.00	$310.60
Taxes			$785.06	0.00	0.00	0.00	785.06
Payments Under Certificates of Judgment .			18,234.91	0.00	0.00	0.00	18,234.91
Total Real Estate			$19,330.57	$0.00	$0.00	$0.00	$19,330.57

WACHUSETTS WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Town of Holden Sewer (WPA Project):							
Total Except the Following Listed Items	$14,261.32	$7,035.85	$8,388.85	$819.05	$237.66	$200.01	$37,657.35
Salaries, Engineering and Clerical	13,683.29	17,498.56	18,181.06	8,761.70	1,503.95	0.00	62,158.05
Labor	5,255.19	6,822.55	12,876.12	3,831.16	0.00	0.00	29,452.47
Materials of Construction	1,728.36	3,925.67	3,097.34	0.00	0.00	0.00	8,751.37
Tools and Equipment	3,624.31	724.60	277.62	0.00	0.00	0.00	8,955.10
Rental of Equipment	0.00	1,788.95	4,654.65	324.00	0.00	0.00	6,767.60
Total Town of Holden Sewer (WPA Project)	$38,552.47	$37,796.18	$47,475.64	$13,735.91	$1,741.61	$200.01	$153,741.94
Town of Rutland Sewer (WPA Project):							
Total Except the Following Listed Items	14,956.37	$6,444.51	$7,468.11	$12,461.41	$2,598.63	$133.58	$34,659.93
Salaries, Engineering and Clerical	7,941.01	6,533.23	8,821.48	6,950.07	9,128.78	530.18	39,942.52
Labor	2,191.01	2,133.21	7,002.35	3,831.16	7,822.37	6.04	32,564.77
Materials of Construction	964.69	8,132.35	2,817.21	300.00	0.00	0.00	12,214.25
Tools and Equipment	4,777.95	710.73	310.96	3.11	3.00	0.00	6,400.22
Rental of Equipment	0.00	70.88	4,180.00	3,995.72	1,584.90	0.00	9,831.50
Total Town of Rutland Sewer (WPA Project)	$30,831.03	$24,024.91	$30,600.11	$27,541.47	$21,137.68	$669.80	$135,613.19
West Boylston Sewer:							
Total Except Salaries	$6.80	$264.09	$336.80	$0.00	$90.83	$644.07	$1,342.59
Salaries, Engineering and Clerical	2,057.67	3,554.99	39.55	0.00	383.95	8,109.64	14,145.80
Total West Boylston Sewer	2,064.47	$3,819.08	$376.35	$0.00	$474.78	$8,753.71	$15,488.39
Total Wachusett-Watershed Protection and Elimination of Pollution (Except PWA)	$74,687.48	$68,423.13	$113,080.28	$62,293.82	$31,572.32	$15,384.26	$419,192.61

WACHUSETT WATERSHED PROTECTION (PWA ONLY)

Total Expenditure	$20.91	$430.04	$0.00	$0.00	$0.00	$0.00	$450.95
Total Wachusett Watershead Protection	$74,708.39	$68,853.17	$113,080.28	$62,293.82	$31,572.32	$15,384.26	$419,643.56

WESTON AQUEDUCT SIPHONS (PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	$656.44	$0.00	$0.00	$0.00	$0.00	$0.00	$6,145.84
ENGINEERING:							
Total Except Salaries	$255.10	$0.00	$0.00	$0.00	$0.00	$0.00	$1,857.36
Salaries, Engineering and Clerical	$4,599.61	0.00	0.00	0.00	0.00	00.0	19,358.11
Total Engineering	$4,854.71	$0.00	$0.00	0.00	$0.00	$0.00	$21,215.47
REAL ESTATE:	$150.00	$418.56	$0.00	$0.00	$0.00	$0.00	$689.00
CONSTRUCTION CONTRACT 73	$30,929.86	$0.00	$0.00	$0.00	$0.00	$0.00	$261,467.58
CONSTRUCTION CONTRACT 91A	149.20	0.00	0.00	0.00	0.00	0.00	1,492.00
CONSTRUCTION CONTRACT 91B	159.04	0.00	0.00	0.00	0.00	0.00	1,590.40
CONSTRUCTION CONTRACT 89	42,940.85	0.00	0.00	0.00	0.00	0.00	42,940.85
OTHER PERMANENT CONSTRUCTION	7.78	21.59	0.00	0.00	0.00	0.00	628.66
TOTAL WESTON AQUEDUCT SIPHONS (PWA)	$79,847.88	$440.15	$0.00	$0.00	$0.00	$0.00	$336,169.80

HULTMAN AQUEDUCT, SUPPLY SECTION (PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office	$2,173.03	$1,200.15	$0.00	$0.00	$0.00	$0.00	$6,771.17
Engineering, Headquarters Office	37,493.00	14,666.11	0.00	0.00	0.00	0.00	114,472.88
Total General Overhead	$39,666.03	$15,866.26	$0.00	$0.00	$0.00	$0.00	$121,244.05
ENGINEERING:							
Total Except the Following Listed Items	$12,772.19	$3,553.39	$467.41	$0.00	$131.00	$0.00	$83,866.00
Salaries, Engineering and Clerical	269,087.76	57,440.97	0.00	0.00	0.00	0.00	543,333.93
Labor	3,656.40	2,694.45	187.68	0.00	0.00	0.00	13,756.90
Automobile Maintenance	5,522.06	2,593.90	681.08	0.00	0.00	0.00	13,792.77
Rent and Upkeep	4,836.01	1,652.23	298.33	0.00	0.00	0.00	11,817.16
Legal Expense	35.00	0.00	3,111.11	0.00	0.00	0.00	3,146.11
Total Engineering	$295,909.42	$67,934.94	$4,745.61	$0.00	$131.00	$0.00	$669,712.87

HULTMAN AQUEDUCT, SUPPLY SECTION (PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
REAL ESTATE:							
Total Except the Following Listed Items	$945.54	$719.61	$212.43	$2.45	$—131.00	$0.00	$3,484.86
Salaries, Engineering and Clerical	7,283.39	0.00	0.00	0.00	0.00	0.00	9,692.51
Legal Expense	16,802.47	6,565.91	585.58	346.46	131.28	0.00	41,106.06
Purchases and Settlements	46,616.21	43,734.15	2,500.00	1,218.59	1,815.00	0.00	165,534.12
Taxes	2,645.58	2,868.35	2,456.46	2,183.78	2,114.79	0.00	12,268.96
Special Agents—Salaries	2,255.42	1,679.32	0.00	0.00	0.00	0.00	4,654.74
Total Real Estate	76,548.61	55,567.34	5,754.47	$3,751.28	$3,930.07	$0.00	$236,741.25
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS:							
Contract 74	$1,484,476.99	$0.00	$0.00	$0.00	$0.00	$0.00	$2,933,832.49
Contract 75	195,882.11	60,230.71	0.00	0.00	0.00	0.00	521,806.66
Contract 77	195,559.00	88,593.45	0.00	0.00	0.00	0.00	496,597.43
Contract 78	207,755.77	97,102.68	0.00	0.00	0.00	0.00	551,629.18
Contract 79	247,594.53	0.00	0.00	0.00	0.00	0.00	522,335.25
Contract 81	23,049.11	40,481.06	0.00	350.00	0.00	0.00	188,029.86
Contract 84	8,955.72	85,717.29	6,000.00	0.00	0.00	0.00	100,673.01
Contract 85	528,448.78	193,459.99	0.00	0.00	0.00	0.00	3,488,194.31
Contract 86	54,325.21	0.00	0.00	0.00	0.00	0.00	57,936.73
Contract 87 A-H	31,924.80	0.00	0.00	0.00	0.00	0.00	38,615.40
Contract 90 B and D	1,367.75	0.00	0.00	0.00	0.00	0.00	1,367.75
Contract 92 D and E	8,446.90	0.00	0.00	0.00	0.00	0.00	8,446.90
Contract 95 A, F, G, H and I	6,363.00	0.00	0.00	0.00	0.00	0.00	6,363.00
Contract 100	6,011.25	0.00	0.00	0.00	0.00	0.00	6,011.25
Contract 101	93.06	0.00	0.00	0.00	0.00	0.00	93.06
Contract 109	0.00	4,984.78	0.00	0.00	0.00	0.00	4,984.78
Contract 121 (Portion)	1,861.20	5,118.80	0.00	0.00	0.00	0.00	6,980.00
Contract 123 A		160.00	0.00	0.00	0.00	0.00	160.00
Contract 128		155.00	0.00	0.00	0.00	0.00	155.00
Contract 130		4,084.85	0.00	0.00	0.00	0.00	4,084.85
Sub Total Construction Contracts	$3,002,115.18	$580,088.61	$6,000.00	350.00	$0.00	$0.00	$8,938,296.91

PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:							
Total Except the Following Listed Items	$4,778.57	$249.55	$464.72	$0.00	$0.00	$0.00	$20,438.67
Labor	0.00	2,600.80	204.84	0.00	0.00	0.00	2,805.64
Maintenance of Partially Completed Structures	0.00	2,387.03	10,953.66	0.00	0.00	0.00	13,340.69
Sub Total Except Constructing Contracts	$4,778.57	$5,237.38	$11,623.22	$0.00	$0.00	$0.00	$36,585.00
Total Permanent Construction	3,006,893.75	585,325.99	17,623.22	350.00	0.00	0.00	8,974,881.91
SUPPLY SECTION DAMAGES—EXCEPT AWARDS BY COURT DECREE:							
Purchases and Settlements	$8,550.15	$0.00	$0.00	$500.00	$0.00	$0.00	$9,050.15
Payments Under Certificates of Judgment	0.00	0.00	0.00	1,525.30	0.00	0.00	1,525.30
Sub Total Damages Except Awards by Court Decree	$8,550.15	$0.00	$0.00	$2,025.30	$0.00	$0.00	$10,575.45
SUPPLY SECTION DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:							
Total Except the Following Listed Items	$480.00	$548.00	$105.55	$200.00	$56.00	$0.00	$1,389.55
Payments Under Certificates of Judgment	9,393.79	7,095.74	0.00	3,540.65	0.00	0.00	20,030.18
Settlements Made by Attorney General in Petitions Brought in Superior Court prior to Judgments	0.00	22,815.17	13,100.00	5,100.00	0.00	0.00	41,015.17
Sub Total Jury Verdicts	$9,873.79	$30,458.91	$13,205.55	$8,840.65	$56.00	$0.00	$62,434.90
SUPPLY SECTION DAMAGES—OTHER COURT AWARDS:							
Payments Under Certificates of Judgment	$0.00	$0.00	$20,200.00	$0.00	$0.00	$0.00	$20,200.00
Total Supply Section—Damages	$18,423.94	$30,458.91	$33,405.55	$10,865.95	$56.00	$0.00	$93,210.35
Total Hultman Aqueduct—Supply Section (PWA)	$3,437,441.75	$755,153.44	$61,528.85	$14,967.23	$4,117.07	$0.00	$10,095,790.43

HULTMAN AQUEDUCT, SUPPLY SECTION (EXCEPT PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office	$0.00	$0.93	$1,153.11	$3,025.03	$491.28	$11.62	$4,681.97
Engineering, Headquarters Office	0.00	2,753.64	2,973.25	7,898.33	1,052.69	20.21	14,698.12
Total General Overhead	$0.00	$2,754.57	$4,126.36	$10,923.36	$1,543.97	$31.83	$19,380.09
ENGINEERING:							
Total Except the Following Listed Items	$0.00	$5.08	$0.00	$1,168.03	$0.00	$0.00	$1,179.87
Salaries, Engineering and Clerical	0.00	10,846.80	21,974.80	8,400.65	746.60	26.50	41,995.35
Automobile Maintenance	0.00	0.00	0.00	105.51	6.76	7.36	144.29
Legal Expense	0.00	0.00	0.00	110.70	31.42	18.77	129.47
Total Engineering	$0.00	$10,851.88	$21,974.80	$9,784.89	$784.78	$52.63	$43,448.98

HULTMAN AQUEDUCT, SUPPLY SECTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
CONSTRUCTION CONTRACT 105	$0.00	$0.00	$216.76	$0.00	$0.00	$0.00	$216.76
CONSTRUCTION CONTRACT 127	0.00	0.00	2,405.00	0.00	0.00	0.00	2,405.00
OTHER PERMANENT CONSTRUCTION	0.00	0.00	0.00	486.85	0.00	0.00	486.85
Total Hultman Aqueduct Supply Section (Except PWA)	$0.00	$13,606.45	$28,722.92	$21,195.10	$2,328.75	$84.46	$65,937.68
TOTAL HULTMAN AQUEDUCT, SUPPLY SECTION	$3,437,441.75	$768,759.89	$90,251.77	$36,162.33	$6,445.82	$84.46	$10,161,728.11

HULTMAN AQUEDUCT, DISTRIBUTION SECTION (PWA)

GENERAL OVERHEAD:							
Administration, Commissioners' Office	$3,915.68	$1,138.15	$0.00	0.00	$0.00	$0.00	$5,976.56
Engineering, Headquarters Office	35,293.00	11,388.57	0.00	0.00	0.00	0.00	72,793.01
Total General Overhead	$39,208.68	$12,526.72	$0.00	$0.00	$0.00	$0.00	$78,769.57
ENGINEERING:							
Total Except the Following Listed Items	$8,737.61	$6,309.05	$271.87	$0.00	$0.00	$0.00	$29,874.12
Salaries, Engineering and Clerical	105,583.50	38,943.30	0.00	0.00	0.00	0.00	189,050.19
Labor	3,516.85	6,605.03	112.84	0.00	0.00	0.00	13,077.90
Automobile Maintenance	2,168.86	2,514.52	464.13	0.00	0.00	0.00	6,214.66
Rent and Upkeep	1,897.89	2,774.72	380.69	0.00	0.00	0.00	6,357.40
Legal Expense	0.00	0.00	7,689.92	0.00	0.00	0.00	7,689.92
Total Engineering	$121,904.71	$57,146.62	$8,919.45	$0.00	$0.00	$0.00	$252,264.19
REAL ESTATE:							
Total Except the Following Listed Items	$1,200.78	$1,125.90	$183.40	$0.75	$0.53	$0.00	$3,102.38
Salaries, Engineering and Clerical	1,742.13	0.00	0.00	0.00	0.00	0.00	2,368.99
Legal Expense	3,032.08	1,324.51	393.22	330.02	210.78	0.00	15,172.17
Purchases and Settlements	13,022.50	27,646.00	150.00	0.00	0.00	0.00	41,802.00
Taxes	1,309.86	889,81	1,179.02	1,171.02	1,169.42	0.00	5,719.13
Total Real Estate	$20,307.35	$30,986.22	$1,905.64	1,501.79	$1,380.73	$0.00	$68,164.67

Permanent Construction — Construction Contracts:							
Contract 80	$367,935.49	$59,686.36	$0.00	$0.00	$0.00	$0.00	$574,183.69
Contract 81	167,372.59	142,137.99	0.00	650.00	0.00	0.00	405,791.12
Contract 85	286,976.32	26,380.91	0.00	0.00	0.00	0.00	730,720.32
Contract 86	22,547.45	0.00	0.00	0.00	0.00	0.00	23,149.37
Contract 87 A	340.74	0.00	0.00	0.00	0.00	0.00	1,218.24
Contract 90 A, B, C	3,387.72	0.00	0.00	0.00	0.00	0.00	3,387.72
Contract 94	138,196.25	52,200.07	0.00	0.00	0.00	0.00	190,396.32
Contract 95 A, B, C, D, E and I	42,924.30	0.00	0.00	0.00	0.00	0.00	42,924.30
Contract 96	48,314.26	6,481.12	0.00	0.00	0.00	0.00	54,795.38
Contract 101	132.83	0.00	0.00	0.00	0.00	0.00	132.83
Contract 104 A, B and C	2,978.00	0.00	0.00	0.00	0.00	0.00	2,978.00
Contract 110	13,561.04	191,633.93	0.00	0.00	0.00	0.00	205,194.97
Contract 123 A	$0.00	$155.00	$0.00	$0.00	$0.00	$0.00	$155.00
Contract 128	0.00	155.00	0.00	0.00	0.00	0.00	155.00
Contract 129	0.00	475.00	0.00	0.00	0.00	0.00	475.00
Contract 130	0.00	5,914.15	0.00	0.00	0.00	0.00	5,914.15
Sub Total Construction Contracts	$1,094,666.99	$485,219.53	$0.00	$650.00	$0.00	$0.00	$2,241,571.41
Permanent Construction—Except Construction Contracts:							
Total Except the Following Listed Items	$1,686.72	$650.09	$499.18	$0.00	$0.00	$0.00	$4,848.03
Labor	0.00	5,474.15	169.92	0.00	0.00	0.00	5,644.07
Maintenance of Partially Completed Structures	0.00	3,703.30	14,137.65	0.00	0.00	0.00	17,840.95
Sub Total Except Construction Contracts	$1,686.72	$9,827.54	$14,806.75	$0.00	$0.00	$0.00	$28,333.05
Total Permanent Construction	$1,096,353.71	$495,047.07	$14,806.75	$650.00	$0.00	$0.00	$2,269,904.46
Distribution Section—Damages—Awards by Court Decree—Jury Verdicts:							
Total Except the Following Listed Items	$100.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100.00
Legal Expense	$2,091.95	1,119.50	511.50	732.15	0.00	0.00	4,455.10
Payments Under Certificates of Judgment	48,062.77	0.00	57,547.85	10,004.98	1,601.90	0.00	117,217.50
Settlement Made by Attorney General in Petition Brought in Superior Court Prior to Judgment	0.00	11,450.00	18,600.00	15,000.00	650.00	0.00	45,700.00
Total Jury Verdicits	50,254.72	$12,569.50	$76,659.35	$25,737.13	$2,251.90	$0.00	$167,472.60
Total Hultman Aqueduct, Distribution Section (PWA)	1,328,029.17	$608,276.13	$102,291.19	$27,888.92	$3,632.63	$0.00	$2,836,575.49

HULTMAN AQUEDUCT, DISTRIBUTION SECTION (EXCEPT PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:							
Administration, Commissioners' Office	0.00	$1.85	$1,163.51	$5,314.74	$2,759.73	$3,036.67	$12,276.50
Engineering, Headquarters Office	548.61	5,691.82	9,000.05	13,876.70	6,796.96	5,257.46	41,171.60
Total General Overhead	$548.61	$5,693.67	$10,163.56	$19,191.44	$9,556.69	$8,294.13	$53,448.10
ENGINEERING:							
Total Except the Following Listed Items	$9,168.75	$3,635.24	$7,359.97	$2,216.60	$1,350.40	$0.00	$24,730.96
Salaries, Engineering and Clerical	0.00	32,638.35	65,686.04	8,689.77	20,065.86	10,943.93	138,023.95
Legal Expense	0.00	75.00	627.52	145.83	0.00	1,831.04	2,679.39
Labor	0.00	0.00	157.76	27.26	334.88	582.37	1,102.27
Miscellaneous Expense (undistributed)	$0.00	$116.16	$515.15	$92.19	$205.94	$35.14	$964.58
Printing and Blueprinting	0.00	39.27	157.85	30.40	95.64	56.03	379.19
Stationery and Office Supplies	0.00	74.80	254.26	63.69	17.98	32.30	443.03
Postage	0.00	46.00	60.94	0.00	5.00	7.50	119.44
Rent and Upkeep	0.00	155.07	643.71	—38.73	134.97	43.48	938.50
Automobile Maintenance	0.00	292.75	663.30	290.10	488.32	283.62	2,018.09
Furniture and Fixtures	0.00	0.00	6.61	0.00	57.50	31.28	95.39
Total Engineering	$9,168.75	$38,072.64	$76,133.11	$11,517.11	$22,756.49	$13,846.69	$171,494.79
CONSTRUCTION CONTRACT 105	0.00	0.00	606.90	0.00	0.00	0.00	606.90
OTHER PERMANENT CONSTRUCTION:	0.00	0.00	0.00	2,094.09	1,200.74	0.00	3,294.83
Total Hultman Aqueduct, Distribution Section (Except PWA)	$9,717.36	$43,766.31	$86,903.57	$32,802.64	$33,513.92	$22,140.82	$228,844.62
TOTAL HULTMAN AQUEDUCT, DISTRIBUTION SECTION	$1,337,746.53	$652,042.44	$189,194.76	$60,691.56	$37,146.55	$22,140.82	$3,065,420.11

SPOT POND BY-PASS AND IMPROVEMENTS TO PUMPING STATION (PWA)

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:	$5,207.35	$1,673.43	$0.00	$0.00	$0.00	$0.00	$14,041.96
ENGINEERING:							
Total Except Salaries	$554.83	$187.50	$0.00	$0.00	$0.00	$0.00	$1,328.51
Salaries, Engineering and Clerical	6,776.93	872.22	0.00	0.00	0.00	0.00	12,078.50
Total Engineering	$7,331.76	$1,059.72	$0.00	$0.00	$0.00	$0.00	$13,407.01
CONSTRUCTION CONTRACT 83	$99,746.39	$16,649.16	$0.00	$0.00	$0.00	$0.00	$141,894.22
CONSTRUCTION CONTRACT 83 A	627.01	467.99	0.00	0.00	0.00	0.00	1,095.00

CONSTRUCTION CONTRACT 90 B and E	1,655.00	0.00	0.00	0.00	0.00	0.00	1,655.00
CONSTRUCTION CONTRACT 92 A, B, C and E	26,496.64	0.00	0.00	0.00	0.00	0.00	26,496.64
CONSTRUCTION CONTRACT 95 A and C	4,849.00	0.00	0.00	0.00	0.00	0.00	4,849.00
CONSTRUCTION CONTRACT 97	11,476.00	0.00	0.00	0.00	0.00	0.00	11,476.00
CONSTRUCTION CONTRACT 104 A and D	3,096.40	0.00	0.00	0.00	0.00	0.00	3,096.40
OTHER PERMANENT CONSTRUCTION	394.71	0.00	0.00	0.00	0.00	0.00	787.51
TOTAL SPOT POND BY-PASS AND IMPROVEMENTS TO PUMPING STATION (PWA)	$160,880.26	$19,850.30	$0.00	$0.00	$0.00	$0.00	$218,798.74

ENLARGING FELLS HIGH-LEVEL DISTRIBUTION RESERVOIR (PWA)

GENERAL OVERHEAD	$4,047.49	$80.78	$0.00	$0.00	$0.00	$0.00	$7,068.98
ENGINEERING:							
Total Except Salaries	$951.19	$91.48	$0.00	$0.00	$0.00	$0.00	$2,148.89
Salaries, Engineering and Clerical	17,910.81	1,929.19	0.00	0.00	0.00	0.00	20,652.55
Total Engineering	$18,862.00	$2,020.67	$0.00	$0.00	$0.00	$0.00	$22,801.44
CONSTRUCTION CONTRACT 99	$141,193.27	$3,922.53	$0.00	$0.00	$0.00	$0.00	$145,115.80
CONSTRUCTION CONTRACT 104 C	354.50	0.00	0.00	0.00	0.00	0.00	354.50
OTHER PERMANENT CONSTRUCTION	103.89	0.00	0.00	0.00	0.00	0.00	103.89
TOTAL ENLARGING FELLS HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)	$164,561.15	$6,023.98	$0.00	$0.00	$0.00	$0.00	$175,444.61

SUMMARY

WATER SUPPLY CONSTRUCTION FUND (TOTALS TO DATE)

Total authorized under Chapters 111 and 375, Acts of 1926 and Chapter 321, Acts of 1927	$65,900,000.00	$65,900,000.00	$65,900,000.10	$65,900,000.00	$65,900,000.00	$65,900,000.00	
Amount reverted from Authorization under said Chapter 111	—261,466.17	—261,466.17	—261,466.17	—261,466.17	—261,466.17	—261,466.17	
Total	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	
Received from City of Worcester under said Chapter 375	$1,000,000.00	$1,000,000.00	$1,000,000.00	$1,000,000.00	$1,000,000.00	$1,000,000.00	
Income Credited to Construction Fund	1,036,931.32	1,049,067.28	1,055,093.35	1,062,955.27	1,073,945.68	1,077,048.88	
Serial Bonds issued and matured	11,278,000.00	12,710,000.00	14,137,000.00	15,626,000.00	17,315,000.00	18,287,000.00	
Serial Bonds outstanding	43,972,000.00	44,040,000.00	44,613,000.00	43,124,000.00	41,435,000.00	40,463,000.00	
Balance of Authorization Available for Issue	8,351,602.51	6,839,466.55	4,833,440.48	4,825,578.56	4,814,588.15	4,811,484.95	
	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	$65,638,533.83	
Contributions by Federal Government From PWA Funds	$5,579,700.00	$5,584,649.38	$7,022,806.50	$7,022,806.50	$7,022,806.50	$7,073,003.78	
Total Construction Fund	$71,218,233.83	$71,223,183.21	$72,661,340.33	$72,661,340.33	$72,661,340.33	$72,711,357.61	

EXPENDITURES

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Southern Sudbury Emergency Supply	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	638,533.83
Ware and Swift Supply (Including Portion Under PWA)							
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct	$167,458.72	$167,718.32	$92,519.77	$86,787.22	$172,236.70	$62,050.35	$15,191,236.04
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct	5,129.84	4,246.43	2,873.00	5,756.19	8,648.66	1,018.09	5,422,431.56
Quabbin Reservoir	1,014,770.00	533,988.96	509,361.31	151,477.93	168,200.69	107,934.20	21,079,986.65
Winsor Dam	326,037.68	323,409.99	29,165.04	10,561.54	12,009.08	8,718.01	5,911,302.21
Quabbin Dike	9,156.85	7,130.60	3,887.70	293.51	11,371.32	483.85	2,903,992.32
Special Investigations	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$149,609.63
Wachusett Watershed Protection and Elimination of Pollution (Including Both PWA and WPA Projects)	74,708.39	68,853.17	113,080.28	62,293.82	31,572.32	15,384.26	419,643.56
Hultman Aqueduct and Other Works, Including Portion Under PWA							
Weston Aqueduct Siphons	$79,847.88	$440.15	$0.00	$0.00	$0.00	$0.00	$336,169.80
Hultman Aqueduct, Supply Section	3,437,411.75	768,759.89	90,251.77	36,162.33	6,445.82	84.46	10,161,728.11
Hultman Aqueduct, Distribution Section	1,337,746.53	652,042.44	189,194.76	60,691.56	37,146.55	22,140.82	3,065,420.11
Spot Pond By-Pass and Improvements to Pumping Station	160,880.26	19,850.30	0.00	0.00	0.00	0.00	218,798.74
Enlarging Fells High Level Distributing Reservoir	164,561.15	6,023.98	0.00	0.00	0.00	0.00	175,444.61
Undistributed General Overhead	0.00	102.72	—102.72	0.00	0.00	0.00	0.00
Total Expenditures	$6,777,739.05	$2,552,566.95	$1,030,230.91 *	$414,024.10*	$447,631.14	$217,814.04	$65,674,297.17

RECEIPTS

	Year Ending Nov. 30, 1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Receipts from Sales §	$7,712.84	$4,116.30	$2,871.42	$4,182.93	$4,719.97	$2,289.20	$451,500.23
Receipts from Rents §	3,158.03	2,860.00	2,186.67	2,393.00	1,540.50	814.00	413,001.87
All other Receipts §	7,311.20	5,159.66	967.98	1,285.99	4,729.94	0.00	240,205.69
Total Receipts, Construction Account	$18,182.07	$12,135.96	$6,026.07	$7,861.92	$10,990.41	$3,103.20	$1,104,707.79

DISTRIBUTION OF RECEIPTS

	Year Ending Nov. 30,1940	Year Ending Nov. 30, 1941	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 Mos. Ending June 30, 1945	Total To June 30, 1945
Credited to Annual Water Assessments as Follows:							
To 1928 Assessment, Rents and Sales . .	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,033.03
To 1939 Assessment, Rents and Sales . .	0.00	0.00	0.00	0.00	0.00	0.00	24,343.77
To Assessments 1927 to Date, Interest . .	0.00	0.00	0.00	0.00	0.00	0.00	282.11
Credited to Contsruction Fund	18,182.07	12,135.96	6,026.07	7,861.92	10,990.41	3,103.20	1,077,048.88
Total Receipts, Construction Account .	$18,182.07	$12,135.96	$6,026.07	$7,861.92	$10,990.41	$3,103.20	$1,104,707.79

* To make proper adjustment for belated transfers from this water supply account to the Nut Island Sewage Account, $5,121.05 originally reported as spent in 1942 has been included in 1943.

§ Differences from previously published reports are only in the distribution between sales, rents and miscellaneous.

Yearly Expenditures and Disbursements by the Metropolitan District Water Supply Commission From Maintenance Funds for the Fiscal Years 1943, 1944 and 1945 (7 months)

WARE SUPPLY AND QUABBIN AQUEDUCT

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
MAINTENANCE AND OPERATION OF WATER SUPPLY WORKS:			
Salaries, Engineering and Clerical	$4,213.96	$4,932.65	$3,932.02
Labor	6,350.78	6,965.95	8,651.85
Supplies	416.37	599.93	450.60
Automobile Maintenance	587.33	1,116.46	446.20
Installed Equipment	686.32	440.71	102.62
Tools and Other Mechanical Equipment	62.98	135.06	140.95
Rent and Upkeep	2,161.96	1,689.16	1,045.52
Miscellaneous Expense (undistributed)	24.77	56.42	9.59
Stationery and Office Supplies	42.76	18.36	18.39
Printing and Blueprinting	0.60	2.50	0.00
Postage	5.55	12.15	9.80
Medical Services	0.00	27.00	7.00
Sub Total Maintenance and Operation of Water Supply Works	$14,553.38	$15,996.35	$14,814.54
MAINTENANCE OF WATERSHED:			
Salaries, Engineering	$749.15	$928.02	$990.66
Labor	87.12	600.31	4,186.90
Supplies	10.23	10.38	38.12
Automobile Maintenance	530.24	423.49	216.41
Tools and Other Mechanical Equipment	44.68	65.96	23.86
Medical and Surgical Services	1.11	9.30	0.00
Rent and Upkeep	124.32	236.00	276.15
Miscellaneous Expense (undistributed)	1.50	1.47	3.00
Stationery and Office Supplies	26.89	13.79	15.91
Printing and Blueprinting	0.61	2.50	0.00
Postage	5.07	5.39	6.10
Sub Total Maintenance of Watershed	$1,580.92	$2,296.61	$5,757.11

WARE SUPPLY AND QUABBIN AQUEDUCT

Guarding and Fire Protection:			
Police Protection			
Salaries, Engineering and Clerical	$66.60	$157.45	$0.00
Labor	10,196.83	9,609.47	36.78
Supplies	4.00	0.00	0.00
Fire Protection			
Salaries, Engineering and Clerical	174.42	249.90	53.60
Labor	934.23	711.44	94.30
Supplies	158.76	812.61	134.70
Automobile Maintenance	63.70	2.26	0.00
Miscellaneous Expense	58.90	45.06	0.00
Sub Total Guarding and Fire Protection	$11,657.44	$11,588.19	$319.38
Maintenance and Operation of Rutland-Holden Sewer:			
Salaries, Engineering	$210.80	$268.00	$375.00
Labor	383.96	1,175.10	268.61
Miscellaneous Expense	0.00	17.68	0.00
Use of City of Worcester Sewerage System	0.00	459.33	708.01
Sub Total Maintenance Rutland-Holden Sewer	$594.76	$1,920.11	$1,351.62
Total Ware Supply and Quabbin Aqueduct	28,386.50	31,801.26	22,242.65

QUABBIN RESERVOIR

Maintenance and Operation of Water Supply Works:			
Salaries, Engineering and Clerical	$10,186.15	$14,124.22	$9,493.71
Labor	15,864.16	18,030.41	10,540.06
Supplies	495.30	1,344.02	1,054.57
Automobile Maintenance	436.26	1,181.79	848.76
Installed Equipment	61.76	258.79	37.45
Tools and Other Mechanical Equipment	229.07	297.58	220.31
Rent and Upkeep	6,195.06	5,366.19	2,270.69
Miscellaneous Expense (undistributed)	308.12	262.55	453.67
Stationery and Office Supplies	29.00	104.73	43.98
Printing and Blueprinting	0.00	3.00	0.00
Postage	7.50	26.00	25.54
Medical and Surgical Services	0.00	27.39	7.00
Sub Total Maintenance and Operation of Water Supply Works	$33,812.38	$41,026.67	$24,995.74

QUABBIN RESERVOIR

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
MAINTENANCE OF RESERVOIR AND WATERSHED:			
Salaries, Engineering and Clerical	$3,022.46	$2,799.90	$1,880.68
Labor	7,653.14	6,842.72	5,645.63
Supplies	153.15	522.56	1,092.15
Automobile Maintenance	351.54	920.37	792.11
Boats and Other Floating Equipment	220.68	255.80	106.96
Radio Equipment	432.47	18.04	53.90
Tools and Other Mechanical Equipment	213.87	611.41	97.63
Rent and Upkeep	5.57	27.50	164.79
Miscellaneous Expense (undistributed)	0.00	48.22	42.17
Stationery and Office Supplies	6.00	14.93	14.61
Printing and Blueprinting	2.42	3.93	0.00
Postage	2.50	10.00	14.68
Medical and Surgical Services	0.00	36.00	2.45
Sub Total Maintenance of Reservoir and Watershed	$12,063.80	$12,111.38	$9,907.76
GUARDING AND FIRE PROTECTION:			
Police Protection			
Salaries, Engineering and Clerical	$481.18	$233.50	$0.00
Labor	15,235.58	14,309.76	91.17
Automobile Maintenance	—144.74	—481.75	237.40
Fire Protection			
Salaries, Engineering and Clerical	451.44	469.50	233.03
Labor	555.80	2,315.30	4,033.53
Automobile Maintenance	19.32	6.43	0.00
Fire Equipment	98.38	341.21	727.10
Supplies	0.00	29.65	0.00
Rent and Upkeep	41.50	44.03	23.39
Miscellaneous Expense	8.10	41.70	40.00
Sub Total Guarding and Fire Protection	$16,746.11	$17,309.33	$5,385.62

MAINTENANCE AND OPERATION OF QUABBIN PARK CEMETERY:

Salaries, Engineering and Clerical	$476.00	$1,568.92	$1,387.21
Labor	2,146.44	7,371.03	4,688.43
Supplies	287.50	271.95	552.58
Automobile Maintenance	14.40	22.89	29.69
Tools and Other Mechanical Equipment	2.05	79.91	69.66
Medical and Surgical Services	0.00	21.00	9.00
Rent and Upkeep	11.00	37.00	24.35
Printing and Blueprinting	0.00	0.00	7.10
Sub Total Maintenance of Quabbin Park Cemetery	$2,937.39	$9,372.70	$6,768.02
Total Maintenance of Quabbin Reservoir	$65,559.68	$79,820.08	$47,057.14

HULTMAN AQUEDUCT—SUPPLY SECTION

Salaries, Engineering and Clerical	$10,116.53	$8,010.38	$5,020.04
Labor	4,011 98	2,779.92	1,710.28
Supplies	34.72	2.00	0.00
Automobile Maintenance	327.51	228.84	327.66
Installed Equipment	35.35	35.16	3.24
Tools and Other Mechanical Equipment	63.94	19.67	13.35
Rent and Upkeep	249.55	347.80	276.34
Miscellaneous Expense (undistributed)	4.12	0.57	3.95
Printing and Blueprinting	0.60	2.00	0.00
Stationery and Office Supplies	3.64	0.40	2.21
Total Maintenance of Hultman Aqueduct, Supply Section	$14,847.94	$11,426.74	$7,357.07

HULTMAN AQUEDUCT—DISTRIBUTION SECTION

Salaries, Engineering and Clerical	$20,300.89	$16,590.75	$9,795.37
Labor	7,729.00	9,077.41	5,462.77
Compensation to Labor for Injuries	0.00	0.00	560.00
Supplies	116.29	231.34	62.91
Automobile Maintenance	429.02	523.65	408.40
Installed Equipment	446.31	252.22	4.21
Laboratory Equipment	0.00	0.00	9.28
Tools and Other Mechanical Equipment	214.62	377.83	90.51
Rent and Upkeep	1,628.35	2,582.11	1,663.83
Medical and Surgical Services	3.00	42.00	936.90
Medical and Surgical Supplies	7.29	0.00	25.00

HULTMAN AQUEDUCT—DISTRIBUTION SECTION

	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 months Ending June 30, 1945
Miscellaneous Expense (undistributed)			
Printing and Blueprinting	$81.87	$46.61	$178.33
Stationery and Office Supplies	8.36	2.00	16.73
Postage	79.80	17.50	8.83
	33.76	33.32	13.00
Total Maintenance of Hultman Aqueduct, Distribution Section	$31,078.56	$29,776.74	$19,236.07

SUMMARY

WATER SUPPLY MAINTENANCE FUNDS

EXPENDITURES

Ware Supply and Quabbin Aqueduct	$28,386.50	$31,801.26	$22,242.65
Quabbin Reservoir	65,559.68	79,820.08	47,057.14
Hultman Aqueduct, Supply Section	14,847.94	11,426.74	7,357.07
Hultman Aqueduct, Distribution Section	31,078.56	29,776.74	19,236.07
Total Expenditures	$139,872.68	$152,824.82	$95,892.93

RECEIPTS

Receipts from Rents	$435.00	$1,115.00	$675.00
Quabbin Park Cemetery	0.00	0.00	0.00
Receipts from Sales of Lots	0.00	192.50	17.50
Interment Fees	51.00	422.00	318.50
Foundation Fees	0.00	128.03	0.00
Receipts from U. S Veterans' Administration for Maintenance of Rutland-Holden Sewer	0.00	355.67	0.00
Total Cash Receipts	$486.00	$2,213.20	$1,011.00

The special fund for Perpetual Care of Lots in Quabbin Park Cemetery held by the State Treasurer, under Chapter 33 of the Resolves of 1936, totalled $14,915.53 on June 30, 1945.

Financial Statement of the Metropolitan District Water Supply Commission As Enlarged by Chapter 720 of the Acts of 1941

Expenditures and Disbursements for the Fiscal Years, 1943, 1944, and 1945 (7 Months) and Total to Date on Acount of Metropolitan Sewage Disposal

SEWAGE DISPOSAL FUND

Authorized under Chapter 512, Acts of 1939, 4% of $15,000,000		$600,000.00
Treasury Notes Issued	$204,000.00	
Balance of Authorization Available for Issue	396,000.00	
	$600,000.00	

EXPENDITURES BY METROPOLITAN DISTRICT COMMISSION 1940-1941

Contract for Borings	$36,291.61	
Preliminary Report of Consulting Engineers	147,303.81	
Miscellaneous	143.85	$183,739.27
New Sewage Disposal Fund Available		$416,260.73

EXPENDITURES

NUT ISLAND SEWAGE TREATMENT PLANT

	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
General Overhead:					
Administration, Commissioners' Office	$0.00	$8.75	$55.60	$8.05	$72.40
Engineering, Headquarters Office	5,198.90	19,506.81	43,543.63	35,249.16	103,498.50
Total General Overhead	$5,198.90	$19,515.56	$43,599.23	$35,257.21	$103,570.90

NUT ISLAND SEWAGE TREATMENT PLANT

	Year Ending Nov. 30, 1942	Year Ending Nov. 30, 1943	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
ENGINEERING (Field):					
Salaries, Engineering and Clerical	$137.50	$9,699.26	$14,448.35	$16,060.84	$40,345.95
Consultant Expense	0.00	0.00	179.44	0.00	179.44
Legal Expense	0.00	452.56	60.00	42.84	555.40
Labor	0.00	354.42	1,092.70	1,208.72	2,655.84
Engineering Instruments	0.00	0.00	12.24	0.00	12.24
Tools and Equipment	0.00	0.00	78.96	34.65	113.61
Laboratory Equipment	0.00	0.00	413.00	0.00	413.00
Laboratory Supplies	0.00	1.50	127.60	82.78	211.88
Rent and Upkeep	0.00	0.00	81.92	83.88	165.80
Automobile Maintenance	0.00	169.01	472.09	289.16	930.26
Maintenance of Mechanical Equipment	0.00	4.50	58.68	7.65	70.83
Miscellaneous Expense (undistributed)	0.00	2.20	287.32	90.88	380.40
Printing and Blueprinting	0.00	6.66	71.21	81.11	158.98
Stationery and Office Supplies	0.00	5.38	12.89	14.00	32.27
Postage	0.00	0.00	11.10	0.00	11.10
Medical and Surgical Services	0.00	5.00	121.17	74.15	200.32
Compensation to Labor for Injuries	0.00	0.00	51.42	0.00	51.42
Total Engineering	$137.50	$10,700.49	$17,580.09	$18,070.66	$46,488.74
TOTAL NUT ISLAND SEWAGE TREATMENT PLANT	$5,336.40	$30,216.05	$61,179.32	$53,327.87	$150,059.64

CHARLES RIVER BASIN, OVERFLOW SOUTH SIDE

	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
GENERAL OVERHEAD:			
Engineering, Headquarters Office	$2,326.75	$545.83	$2,872.58
ENGINEERING (Field):			
Salaries, Engineering and Clerical	$0.00	$875.71	$875.71
TOTAL CHARLES RIVER BASIN, OVERFLOW SOUTH SIDE	$2,326.75	$1,421.54	$3,748.29

CHARLES RIVER BASIN, OVERFLOW NORTH SIDE

General Overhead:			
Engineering, Headquarters Office	$157.19	$1,610.54	$1,767.73
Engineering (Field):			
Salaries, Engineering and Clerical	$0.00	$592.30	$592.30
Total Charles River Basin, Overflow North Side	$157.19	$2,202.84	$2,360.03

SUMMARY

	Year Ending Nov. 30, 1944	7 mos. Ending June 30, 1945	Total To June 30, 1945
Nut Island Sewage Treatment Plant	$61,179.32	$53,327.87	$150,059.64
Charles River Basin, Overflow South Side	$2,326.75	$1,421.54	$3,748.29
Charles River Basin, Overflow North Side	$157.19	$2,202.84	$2,360.03
Total Expenditures	$63,663.26	$56,952.25	$156,167.96

The principal financial items of this report are in agreement with the Comptroller's books.

Nov. 14, 1946
Checked by William Cohen
Fred A. Moncewicz, *Comptroller.*

A tabulation of the acts and resolves under the authority of which expenditures are made by the Metropolitan District Water Supply Commission was published in the 1937, 1938 and 1939 Annual Reports.

A subsequent acts and resolves are as follows:

Chapter	*Brief Description*
45, Resolves of 1941	Investigation for use of Quabbin Reservoir by Additional municipalities.
91, Resolves of 1941	Further investigation of use of Quabbin Reservoir by additional municipalities.
384, Acts of 1941	Increased reimbursement of Hamden County Trail costs.
461, Acts of 1941	Metropolitan Police to patrol Quabbin Reservoir.
536, Acts of 1941	Welfare Relief Reimbursement to Towns of Dana, Enfield, Greenwich and Prescott.
720, Acts of 1941	Enlargement of the Metropolitan District Water Supply Commission, for purpose of constructing additional works for North and South Metropolitan Sewerage Districts.
16, Resolves of 1943	Investigation of possibility of Release from Quabbin Reservoir to Ware River.
370, Acts of 1943	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1943 and 1944 (Item 8902-35).
42, Resolves of 1945	Authorizing payment to Guy Marvel of Petersham.
59, Resolves of 1945	Investigation of conditions in the Neponset River by Joint Board.
83, Resolves of 1945	Investigation of water supply for municipalities in Connecticut, Chicopee, Swift, Ware, Quaboag and Millers River Valleys, by special commission.
279 and 637, Acts of 1945	Changing fiscal year to end June 30.
490, Acts of 1945	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1945 (Item 8902-25).
603, Acts of 1945	Increased reimbursement of Hamden County Trail costs.
682, Acts of 1945	Maintenance expenditures by Metropolitan District Water Supply Commission authorized for 1946 (Item 8902-35).
705, Acts of 1945	Further providing for enlargement of the Metropolitan District Water Supply Commission for purpose of constructing additional sewerage works.

CANVASS OF BIDS FOR CONTRACT 94 — OPENED FEB. 5, 1940.

COMMONWEALTH OF MASSACHUSETTS
METR DISTR. WATER SUPPLY COMMISSION
CONTRACT 94
FOR SINKING THE CHARLES RIVER SHAFT
IN THE TOWN OF WESTON,
MASSACHUSETTS.
PWA DOCKET NO. MASS 1551-F MASS STATE PROJECT NO D-208

Item	Description	Unit	Quantity	★ ① John MacDonald Construction Co, 215 California St, Newton, Mass		② The Foundation Company, 120 Liberty St, New York, N Y		③ New England Foundation Co, Inc, 30 Chauncy St, Boston, Mass		④ B Perini & Sons, Inc, Framingham, Mass		⑤ A Baruffaldi Co, 52 Powder House Blvd, Somerville, Mass		⑥ Coleman Bros Corp 245 State St, Boston, Mass.		⑦ Senior & Palmer Incorporated, 50 Church St, New York City N.Y.	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Stripping and storing topsoil	Cu Yd.	1000	50	500.00	.35	350.00	.40	400.	.50	500.	50	500.	1.	1000.	.50	500
2	Construction of shaft down to El -50	L.S.	—	—	85873.	—	115500.	—	108000.	—	114668.	—	147900.	—	150,000.	—	162500
3	Excavation other than for shaft	Cu. Yd	12000	.50	6000.	.30	3600.	.40	4800.	.15	1800	70	8400.	.30	3600.	.25	3000
4	Shaft excavation below El. 50	Cu. Yd	1500	19 00	28500.	12.	18000.	22.	33000.	15.79	23685.	12	18000.	20.	30000.	12.	18000
5	Compacted refill and embankment	Cu. Yd	1000	.50	500.	1.	1000.	.60	600.	1.	1000	50	500.	.60	600.	1.	1000
6	Miscellaneous embankment	Cu. Yd	6000	.50	3000.	30	1800.	20	1200.	.50	3000	40	2400	.30	1800.	.50	3000.
7	Drilling holes in rock and masonry	Lin Ft	2000	.75	1500.	.50	1000.	60	1200.	.60	1200	.50	1000.	1.	2000.	.50	1000
8	Furnishing and placing grout	Cu Yd	500	8.00	4000.	8.	4000.	8.	4000.	8.	4000	8.	4000.	8.	4000.	8.	4000
9	Sand for grout placed under Item 8	Ton	150	2.00	300.	2.50	375.	2.	300.	3	450	1.50	225.	3.	450.	2.	300.
10	Concrete below El -50	Cu Yd	500	16.00	8000.	10.	5000.	9	4500.	10.	5000.	12.	6000.	13.	6500.	12.	6000.
11	Concrete, outside limits of shaft	Cu Yd	1000	14.00	14000	10.	10000.	11.	11000.	12.81	12810	8.	8000.	13.	13000.	8.	8000.
12	Portland cement, other than for shaft above El -50	Barrel	7000	2.60	18200.	2.60	18200.	2.60	18200.	2.60	18200	2.60	18200.	2.60	18200.	2.60	18200.
13	Reinforcing steel, other than for shaft above El -50	Pound	110000	.05½	6050.	.06	6600.	.05	5500.	.05	5500	.04½	4950.	.05	5500.	.06	6600.
14	Cast-Iron pipe and specials, other than for shaft above El -50	Pound	60000	.07	4200.	.07	4200.	.07	4200.	.07	4200	.06	3600.	.06	3600.	.08	4800.
15	Misc lumber, outside limits of shaft	MftB.M.	25	80.00	2000.	125	3125.	90.	2250.	200.	5000	100.	2500.	100.	2500.	100.	2500.
16	Steel plate lining, below El. -50	Pound	50000	.09	4500	.09	4500.	.10	5000.	.10	5000	.10	5000.	.06	3000.	.10	5000.
17	Steel plate pipe, outside limits of shaft	Pound	100000	.11	11000.	.15	15000.	.12	12000.	.15	15000	.15	15000	.10	10000.	.12	12000.
18	Mortar lining of steel pipe outside limits of shaft	Sq Ft	4000	.75	3000.	.70	2800	.90	3600.	45	1800.	.60	2400.	40	1600.	.50	2000.
19	Crushed stone and screened gravel outside limits of shaft	Cu. Yd.	200	2.00	400.	3	600.	3.	600.	3	600	2.	400.	2.	400.	3.50	700
20	Misc steel and iron outside limits of shaft	Pound	2000	.12	240.	12	240.	.15	300	.25	500	.10	200.	.10	200.	20	400.
21	Non-ferrous metals, other than for shaft above El -50	Pound	1000	1.00	1000.	.40	400.	.80	800.	60	600	1.	1000.	1.	1000.	.50	500.
22	Caring for and setting valves furnished by the Comm	Pound	150000	.04	6000.	.02	3000.	.03	4500.	.03½	5250.	.04	6000.	.02	3000.	02	3000.
23	Caring for and setting misc. metal work furn. by the Comm	Pound	60000	.04	2400.	04	2400.	.04	2400.	.05	3000.	.04	2400.	.02	1200.	02	1200.
24	Galvanizing	Pound	2000	.10	200.	.02	40.	.06	120.	.05	100.	.10	200	20	400.	.07	140.
25	Cleaning up	L.S.	—	—	1000.	—	500.	—	1000	—	5000	—	500.	—	1000.	—	1000.
27	Timber for shaft support below El -50, if any, fixed price $100 per	Mft B M															
28	Protect coat cement mortar below El -50, if any, fixed price $35 per	Cu Yd															
	Sub-Total (Items 1 to 25 inclusive)				212,363		222,230		229,470		237,863		259,275.		264,550		265,340
26	Furnishing performance bond. Rate per $1,000			15.	3,185.45	15.	3333 45	15.	3442.05	15.	3567.94	15.	3889.13	15.	3,968.25	15.	3,980.10
	Totals				215,548.45		225,563 45		232,912.05		241,430.94		263,164.13		268,518.25		269,320.10
	Bid security			BB 20,000		BB 13,750		BB 12,000		BB 25,000		BB 25,000		BB 20,000		CC 15,000	

Item	Description	⑧ Silas Mason Company, Inc., 500 Fifth Ave, New York City, N.Y.		⑨ The Peter F. Connolly Co., Perth Amboy, New Jersey		⑩ J. F Fitzgerald Construction Co, 214 Essex St, Boston, Mass		⑪ C & R Construction Co., 75 Bradeen St, Roslindale, Mass		⑫ Dravo Corporation Neville Island Branch, Pittsburgh, Pa		⑬ Spencer White & Prentis, Inc, 10 E. 40th. St., New York, N.Y.	
		Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Stripping and storing topsoil	1.00	1000.	1.50	1500.	1.00	1000.	1.00	1000.	1.50	1500.	1.20	1200.
2	Construction of shaft down to El -50	—	148000.	—	179250.	—	190897.	—	235500.	—	196000.	—	218150.
3	Excavation other than for shaft	1	12000.	1.40	16800.	.70	8400.	.20	2400.	1.	12000.	.60	7200.
4	Shaft excavation below El. 50	20.	30000.	15.	22500.	20.	30000.	20	30000.	25.	37500.	25.	37500.
5	Compacted refill and embankment	60	600.	1.50	1500.	.80	800.	1.	1000.	1.	1000.	1.25	1250.
6	Miscellaneous embankment	30	1800.	.30	1800.	.60	3600.	.50	3000.	.80	4800.	.75	4500.
7	Drilling holes in rock and masonry	60	1200.	50	1000.	1 25	2500.	1.	2000.	1.20	2400.	1.50	3000
8	Furnishing and placing grout	8.	4000.	8.	4000.	8.	4000	8	4000.	8.	4000.	8.	4000.
9	Sand for grout placed under Item 8	2.50	375.	1.	150.	2.	300.	2.	300.	8.	1200.	2.	300.
10	Concrete below El -50	15	7500.	7.	3500.	15.	7500.	14.	7000.	20.	10000.	20	10000.
11	Concrete, outside limits of shaft	12 50	12500.	8	8000.	7.	7000.	10.	10000.	20.	20000.	15.	15000.
12	Portland cement, other than for shaft above El -50	2.60	18200.	2.60	18200.	2.60	18200.	2 60	18 200.	2.60	18 200.	2.60	18200.
13	Reinforcing steel, other than for shaft above El -50	.06	6600.	.05	5500.	.06	6600.	.05	5500.	.06	6600.	.07	7700.
14	Cast-Iron pipe and specials, other than for shaft above El -50	.08	4800.	.05	3000	.09	5400.	.06	3600.	.10	6000.	.12	7200.
15	Misc lumber, outside limits of shaft	120.	3000.	100.	2500	100.	2500.	80.	2000.	150.	3750.	100.	2500.
16	Steel plate lining, below El. -50	.08	4000.	.10	5000.	.10	5000.	08	4000.	.15	7500.	.15	7500.
17	Steel plate pipe, outside limits of shaft	.14	14000.	.12½	12500.	.11	11000.	.13	13000.	.15	15000.	.15	15000.
18	Mortar lining of steel pipe outside limits of shaft	.70	2800.	.60	2400.	.50	2000.	.50	2000.	.75	3000.	.60	2400.
19	Crushed stone and screened gravel outside limits of shaft	3.	600.	3.	600.	3.	600.	2.50	500.	3.	600.	3.	600.
20	Misc steel and iron outside limits of shaft	.20	400.	.15	300.	.15	300.	.20	400.	.30	600.	.20	400.
21	Non-ferrous metals, other than for shaft above El -50	1.	1000.	.60	600.	.90	900.	1.	1000.	1.	1000.	1.	1000.
22	Caring for and setting valves furnished by the Comm	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.02	3000.	.07	10500.
23	Caring for and setting misc. metal work furn. by the Comm	.05	3000.	.02	1200.	.03	1800.	.03	1800.	.02	1200.	.07	4200.
24	Galvanizing	.05	100.	.05	100.	.04	80.	.05	100.	.10	200.	.10	200.
25	Cleaning up	—	1000.	—	2000.	—	1000.	—	500.	—	950.	—	5000.
27	Timber for shaft support below El -50, if any, fixed price $100 per												
28	Protect coat cement mortar below El -50, if any, fixed price $35 per												
	Sub-Total (Items 1 to 25 inclusive)		281,475.		296,900		314,377.		351,800.		358,000.		384500.
26	Furnishing performance bond. Rate per $1,000	15.	4222.12	10.	2969.	15.	4715 65	15.	5277.	15.	5370.	15.	5767.50
	Totals		285,697.12		299,869.		319,092 65		357,077.		363,370.		390,267.50
	Bid security	BB 25,000		BB 25000		BB 25000		BB 25000.		CC 22,500.		BB. 35,000	

★ Contract awarded Feb 7, 1940
Contract executed Feb 20, 1940

I certify the foregoing to be a true and accurate summary of all bids on the above Contract 94 received this day by the Metr Distr. Water Supply Commission.

R Nelson Mott Sec

R Nelson Mott, Secretary

B B indicates Bid Bond
C C indicates Certified Check

Tabulated by CKO
Checked by E.L.P

FILE CONT 94-3.33X ACC 26,718

CANVASS OF BIDS FOR CONTRACT 110 — OPENED AUG. 29, 1940

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
CONTRACT 110
FOR THE COMPLETION OF CHARLES RIVER SHAFT
IN THE TOWN OF WESTON, MASSACHUSETTS.
P.W.A DOCKET NO. MASS. 1551-F MASS. STATE PROJECT NO. D-208

				★ ① C&R Construction Co. #75 Bradeen Street Roslindale Mass.		② A. Baruffaldi Co. 52 Powder House Blvd. Somerville Mass.		③ The Arundel Corporation Pier 2 Pratt St. Baltimore, Md.		④ V. Barletta Co. 10 Whipple Ave Roslindale Mass.		⑤ B Perini & Sons, Inc. Framingham Mass.		⑥ The Deliso Construction Co, Inc. 528 Main St. Springfield Mass.		⑦ John MacDonald Construction Co. 215 California Street Newton Massachusetts		⑧ West Construction Company Room 900, Sixty State Street Boston, Mass.	
Item	Description	Unit	Quantity	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
1	Excavation for shaft and tunnel	Cu. Yd.	7,000	12.00	84,000.00	16	112,000.00	16	112,000.00	21.00	147,000.00	20.00	140,000.00	24.00	168,000.00	21.	147,000.		
2	Enlargement of shaft and tunnel	Cu Yd	200	12.	2,400.	5.	1,000.	10.	2,000.	21.	4,200.	20.	4,000.	15.	3,000.	21.	4,200.		
3	Pumping	Mil Ft.Gal	6,000	.50	3,000.	.50	3,000.	.60	3,600.	1.	6,000.	.10	600.	.50	3,000.	2.	12,000.		
4	Concrete masonry	Cu. Yd.	5,000	12.	60,000.	10.	50,000.	10.25	51,250.	10.	50,000.	12.	60,000.	15.	75 000.	20.	100,000.		
5	Excess concrete masonry	Cu Yd.	100	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.	5.	500.		
6	Structural - Steel support	Pound	100,000	.075	7,500.	.04	4,000.	.07	7,000.	.08	8,000.	.07	7,000.	.07	7,000.	.10	10,000.		
7	Timbering	M.Ft.B.M.	80	120.	9,600.	60.	4,800.	120.	9,600.	100.	8,000.	70.	5,600.	120.	9,600.	150.	12,000.		
8	Dry packing	Cu Yd.	100	8.	800.	4.	400.	6.	600.	7.	700.	5.	500.	5.	500.	8.	800.		
9	Drilling holes in rock or masonry	Lin. Ft.	3,000	.50	1,500.	.30	900.	.55	1,650.	1.25	3,750.	.70	2,100.	1.	3,000.	1.	3,000.		
10	Steel pipe for grouting, etc.	Lin. Ft.	1,500	.50	750.	.25	375.	.75	1,125.	.60	900.	.50	750.	.80	1,200.	1.	1,500.		
11	Connections for grouting	Connection	100	10.	1,000.	5.	500.	6.	600.	5.	500.	2.50	250.	3.	300.	3.	300.		
12	Sand for grout and for protective coating of cement mortar	Cu Yd.	100	1.50	150.	2.	200.	6.	600.	5.	500.	3.	300.	2.	200.	3.	300.		
13	Mixing and placing grout	Cu. Yd.	500	20.	10,000.	8.	4,000.	25.	12,500.	15.	7,500.	10.	5,000.	8.	4,000.	15.	7,500.		
14	Protective coating of cement mortar	Cu. Yd	50	50.	2,500.	15.	750.	30.	1,500.	10.	500.	40.	2,000.	25.	1,250.	60.	3,000.		
15	Portland cement	Barrel	12,000	2.50	30,000.	2.40	28,800.	2.30	27,600.	2.50	30,000.	2.48	29,760.	2.55	30,600.	2.80	33,600.		Cost plus 10%
16	Steel for Reinforcing Concrete	Pound	50,000	.05	2,500.	.03	1,500.	.06	3,000.	.05	2,500.	.05	2,500.	.055	2,750.	.08	4,000.		
17	Steel plate lining	Pound	250,000	.12	30,000.	.10	25,000.	.075	18,750.	.085	21,250.	.09	22,500.	.09	22,500.	.18	45,000.		
18	Steel pipe bituminous lined - 16"	Lin Ft	275	3.60	990.	5.	1,375.	640	1,760.	7.	1,925.	10.	2,750.	5.	1,375	6.	1,650.		
19	Steel pipe bituminous lined - 20"	Lin Ft	550	4.25	2,337.50	7	3,850.	7.	3,850.	8.	4,400.	10.50	5,775.	6.	3,300.	8.	4,400.		
20	Steel pipe bituminous lined - 24"	Lin Ft.	275	5.25	1,443.75	8.	2,200.	825	2,268.75	10.	2,750.	12.	3,300.	7.	1,925.	12.	3,300.		
21	Miscellaneous earth excavation	Cu Yd.	2,000	.60	1,200.	.30	600.	1.	2,000.	.50	1,000.	.75	1,500.	.50	1,000.	1.	2,000.		
22	Miscellaneous refill and embanking	Cu. Yd.	2,000	.50	1,000.	.30	600.	1.	2,000.	.50	1,000.	.75	1,500.	.30	600.	1.	2,000.		
23	Galvanizing	Pound	3,000	.05	150.	.05	150.	.05	150.	.05	150.	.10	300.	.10	300.	.10	300.		
24	Non-ferrous metals	Pound	100	1.	100.	.60	60.	1.50	150.	1.	100.	1.50	150.	1.	100.	1.	100.		
25	Locker house	Lump S.	1	1000.	1,000.	10,000.	10,000.	2600.	2 600.	2,000.	2,000.	5,000.00	5,000.	3,000.00	3,000.	3,000.	3,000.		
26	Miscellaneous lumber not included in Item 7	M.Ft.B.M.	5	100.	500.	60.	300.	165.	825.	50.	250.	80.	400.	100.	500.	150.	750.		
27	Miscellaneous cast iron and steel	Pound	10,000	.15	1,500.	.08	800.	.12	1,200.	.15	1,500.	.09	900.	.15	1,500.	.20	2,000.		
28	Cleaning up	Lump S		1,000.	1,000.	1,500.	1,500.	5,500.	5,500.	2,000.	2,000.	6,000.	6,000.	1500.	1,500.	2,000.	2,000.		
	Sub-Totals				257,421.25		259,160.00		276,178.75		308,875.00		310,935.00		347,500.00		406,200.00		
29	Furnishing performance bond. Rate per $1,000			15.	3,861.32	15.	3,887.40	15.	4,142.68	15.	4,633.13	15.	4,604.02	15.	5,212.50	15.	6,093.00		
	Totals				261,282.57		263,047.40		280,321.43		313,508.13		315,599.02		352,712.50		412,293.00		
	Bid security — B B indicates bid bond; C C indicates certified check			C.C	15,000.	C C	15,000.	B.B.	17,500.	C.C.	17,500.	C.C.	16,000.	C.C.	20,000	B.B.	25,000.		

Tabulated by: A.J.C.
Checked by: E.G.M.

★ Contract Awarded Sept 6, 1940
Contract Executed Sept 13, 1940

I certify the foregoing to be a true and accurate summary of all bids on the above Contract No 110 received this day by the Metr. Distr. Water Supply Commission. R Nelson Molt
R Nelson Molt, (Secretary)

FILE CONT 110-333X Acc. 27,140

CANVASS OF BIDS FOR CONTRACT 111 — OPENED OCTOBER 3, 1940

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR WATER SUPPLY COMMISSION

CONTRACT 111

FOR CONSTRUCTING THE OUTLET WORKS SUPERSTRUCTURE AND APPURTENANCES AT WINSOR DAM IN THE TOWN OF BELCHERTOWN, MASSACHUSETTS
PWA DOCKET NO MASS 1551-F MASS STATE PROJECT NO D-208

Item	Description	Unit	Quantity	★ ① Chandler Construction Co, Inc 45 Newbury Street, Boston, Mass		② Warnard Constructors, Inc, 64 Hilltop St., Dorchester Mass		③ John F Griffin Co, 238 Main St, Cambridge, Mass		④ Frankini Construction Company, 30 Mystic Avenue Medford, Mass		⑤ Frank T Westcott 95 High St, North Attleboro, Mass		⑥ Daniel Cunningham Construction Co, Inc 1105 Statler Bldg, Boston, Mass	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
	Earth excavation	Cu Yd	300	1	300	1 50	450	1 20	360	*1 61⅓	484	1	300	2.12	636
2	Rock excavation	Cu Yd	40	5.	200	5	200	5.	200	5.	200	5	200	5.	200
3	Refill and embankment	Cu Yd	300	35	105	1	300.	90	270	*1 67⅓	502	2	600.	94	282
4	Soil dressing	Cu Yd	100	35	35	2.50	250.	3	300	3 24	324	2	200	2.22	222.
5	Cobble gutters and paving	Lp Sum		71	71.	50.	50	75	75	108	108	100	100	100	100.
6	Miscellaneous concrete masonry	Cu Yd	50	10	500	20	1,000	8	400	*12 96	648	20	1,000.	20.	1000.
7	Concrete masonry and granolithic finish	Lp Sum		868	868	1,200	1,200	944	944	980	980	2000	2,000	1000.	1000.
8	Portland cement	Barrel	175	2 44	427.	3	525	2 85	498 75	*2.69	470 50	3	525	2 60	455
9	Reinforcing steel	Pound	2000	06	120	.08	160	06	120	05	100	07	140	055	110
10	Miscellaneous iron and steel	Lp.Sum		589	589	839	839	689	689	756	756	850	850	640	640
11	Galvanizing	Lp Sum		85	85	100	100	85.	85	54	54	100	100	85	85
12	Miscellaneous non-ferrous metals	Pound	500	1.	500	60	300	.85	425	*756	378	1	500.	80	400
13	Stone masonry	Lp Sum		5,767	5,767	5,650	5,650	6,649	6649	5,130	5,130	5,000	5,000	8800	8,800
14	Glazed tile masonry	Lp Sum		4 138	4,138	4,600	4600	6494	6494	2,808	2,808	4000	4 000	6 400	6,400
15	Brick masonry	Lp Sum		4,756	4,756	5,500	5,500	6234	6,234	5,304.	5,304	8,000	8000	8,700.	8700
16	Carpentry	Lp Sum		885	885	720	720	399.	399	1,080	1000	2,000	2,000	800	800
17	ng for and installing traveling crane furn by the Comm	Lp Sum		550	550	420	420	250.	250	324	324	300.	300	350	350
18	aring for and installing vacuum pump furn by the Comm	Lp Sum		52	52	215	215	75.	75	54	54	300	300	125	125
19	Caring for and installing Venturi meter register indicator recorders furn by Comm	Lp Sum		116	116	725	725	100.	100	108	108	300.	300	150	150
20	Structural steel	Lp Sum		4,950 *	4,950	5,770	5,770	5,777	5,777	6,241	6,241.	5,777	5,777	6377	6,377
21	Mortar covering for structural steel	Lp Sum		2050	2,050	2050	2,050	2 050	2,050	2214	2,214	2,050	2,050	2 250	2,250
22	Precast concrete roof slabs	Lp Sum		1 733	1,733	1,733	1,733.	1,733.	1,733	1 877	1 877	1 733	1,733	2 033	2 033
23	Roofing and sheet copper work	Lp Sum		2 342	2,342	2342	2342	2,342.	2,342	2 534	2 534	2,342	2,342	2 642	2 642
24	Bronze work	Lp Sum		4,228	4 228	4,228	4228	4,228	4 228	4,565	4,565	4,228	4228	4 528	4528
25	Painting	Lp Sum		200	200	400	400	800.	800	972.	972	1,200	1,200.	600	600.
26	Plumbing	Lp Sum		635	635	635	635	635.	635	706	706	635	635.	735	735
27	Electrical work	Lp Sum		10,880	10880	10 886	10886	10,880	10,880	14,278	14 278	10,880	10880	11 680	11,680
	Sub-total (Items 1 to 27 inclusive)				47082 00*		51,248 00		53012 75		53199 50		55,260 00		61 300 00
28	Furnishing performance bond rate per $1,000			15	706 23*	15	768 72	15.	795 19	15	797 99	15	828 90	15	919 50
	Totals				$47788 23*		$52,016 72		$53,807 94		$53,997 49		$56088 90		$62,219 50
	Bid Security (BB - Bid Bond)			BB 2,500 00		BB 1500 00		BB 3500 00		B.B 3500 00		BB 3000 00		BB 5000 00	

Tabulated by RHW
Checked by D C F

SUBDIVISION OF PROPOSED CONTRACT SUM

Item	Description	① Chandler Construction Co, Inc		② Warnard Constructors, Inc		③ John F Griffin Co		④ Frankini Construction Company		⑤ Frank T Westcott		⑥ Daniel Cunningham Construction Co, Inc	
		Amount		Amount		Amount		Amount		Amount		Amount	
	Group A (All work other than Group B)	$20,770 23		$23965 72		$25 362.94		$23089 49		$27243 90		$33974 50	
	Group B (The work of all subcontractors)	Amount	Sub bidder	Amount	Sub bidder	Amount	Sub bidder	Amount	Sub bidder	Amount	Sub bidder	Amount	Sub bidder
20	Structural steel	4,950	A	5,777	B	5,777	B	5,777	B	5,777	B	5,777	B
21	Mortar covering for structural steel	2050	C	2,050	C	2,050	C	2,050	C	2050	[illegible]	2,050	C
22	Precast concrete roof slabs	1,733	D	1,733	D	1,733.	D	1,733	D	1,733	D	1 733	D
23	Roofing and sheet copper work	2,342	E	2342	E	2,342.	E	2,342	E	2,342	E	2 342	E
24	Bronze work	4,228	K	4,228	K	4,228	K	4228.	K	4 228	K	4,228	K
25	Painting	200	•	400	•	800	•	900.	•	1200	L	600	Estimate
26	Plumbing	635	M	635.	M	635	M	656	N	635	M	635	M
27	Electrical work	10,880	P	10,086	P	10880	P	13,222	Q	10,880	P	10880	P
	Sub total (Group B Items 20 to 27 incl)	27,018 00		28,051 00		28,445 00		30,908.00		28 845 00		28245 00	
	Total amount for entire Contract	$47,788 23		$52,016 72		$53,807 94		$53,997 49		$56088.90		$62 219 50	

SUB-BIDDERS

No	Name	Address	Item	Description	Amount
A	Chandler Construction Co, Inc	45 Newbury Street, Boston	20	Structural steel	$4,950 °
B	West End Iron Works	267 Columbia Street Cambridge		"	5,777
C	National Gunite Contracting Co	82 West Dedham Street, Boston	21	Mortar covering for structural steel	2,050
D	Federal-American Cement Tile Co	1500 Statler Building Boston	22	Precast concrete roof slabs	1,733
E	Atlantic Roofing & Skylight Works	9 Howard St Roxbury	23	Roofing and sheet copper work	2,342
F	Highland Sheet Metal Works	173 Webster Ave, Cambridge	"	" "	2,570
G	Burgess & Blacher Co	18 Eustis St, Roxbury	"	" "	2,636
H	Columbia Cornice Co	268 Elm St Cambridge	"	" "	2,750
J	Eagle Cornice & Skylight Works	197 Sidney St Cambridge	"	"	3,370
K	General Bronze Corporation	Long Island City NY & 92 Bedford St Boston	24	Bronze work	4,228
L	Frank T Wescott	95 High St, North Attleboro	25	Painting	1 200 °
M ▲	Dunnells & Lanagan Co	334 Washington St Brookline	26	Plumbing	635
N ▲	J G Lamotte & Son Inc	98 Granite Street, Boston		"	656
O	Frank T Westcott	95 High St, North Attleboro	"		1,000 °
P	Federal Electric Construction Co	95 Harvey St No Cambridge	27	Electrical work	10880
Q	A C Senecal Co	Westboro			13 222
R	Anderson-Coffey Co	22 Shawmut Street, Boston	"		23401

* Note In the award of the Contract to the Chandler Construction Co Inc, the bid of the West End Iron Works in the amount of $5777 00 was substituted for Item 20 changing figures as follows, Item 20 to $5777 00, Sub total (Items 1 to 27 incl) to $47,909 00, Item 28 to $710 64; and Total to $48627 64

★ Selected as General Contractor Oct 3 1940
Contract awarded Oct [illegible] 1940
Contract executed Oct 18 1940

Notes,
* - Computed by M D W S C from extended totals
• - Contractors own name listed but no record copy of sub bid received by the Commission.
▲ - No bid security filed
° - Sub bid limited to same General Contractor

I certify the foregoing to be a true and accurate summary of all bids on the above Contract 111 received this day by the Metr Distr Water Supply Commission

R Nelson Molt
R Nelson Molt Secretary

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Public Document No. 147

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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING JUNE 30, 1946

Publication of this Document Approved by the Commission on Administration and Finance
[illegible]

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents its

TWENTY-FIRST ANNUAL REPORT

I. Organization and Administration

William T. Morrissey continued as Chairman of the Commission. Edward J. Kelley and Charles H. Brown continued as Associate Commissioners, Mr. Kelley throughout the fiscal year and Mr. Brown until his death, February 4, 1946. Mr. Brown was succeeded by Louis B. Connors, February 20, 1946. R. Nelson Molt continued as Secretary. Karl R. Kennison continued as Chief Engineer, with other engineering personnel as described in his report, attached hereto.

The offices of the Commission were continued at 20 Somerset Street, Boston, together with the Headquarters Office of the Engineering Department. Field offices were continued at the Administration Building near Winsor Dam in Belchertown and at other locations indicated in the accompanying report of the Chief Engineer.

The Commission, as organized by Chapters 375 and 321, has continued the work provided for under those acts and has carried on other duties as a member of various Special Legislative Committees. The Engineers, under the direction of Chief Engineer Kennison and upon instructions of the Commission, have secured and provided much data and furnished many plans and specifications for use of these special committees.

Data have been secured for the purpose of clarifying the provisions of law affecting the conditions of those entering the Metropolitan Water District under the flat rate fixed at $40.00 per mil. gals.

Investigations and procurement of data were undertaken for use of the Special Legislative Committee studying the water need of the cities and towns in the Ware, Swift, Quaboag, Chicopee, Connecticut and Millers River Valleys, and the possible utilization of Quabbin Reservoir or the supply of the City of Springfield as a source of supply.

Further studies were made of the method of improvement of the conditions of the Neponset Valley for use of a Special Legislative Committee which reported to the General Court in 1946.

The Commission and the engineers also have been engaged in carrying out the provisions of Chapter 705 of the Acts of 1945 for the improvement of the Metropolitan sewerage systems and a report thereon is being filed.

II. Swift River Supply

During 1946 the draft upon Quabbin Reservoir to Wachusett was 10,475,000,000 gallons. The reservoir reached elevation 529.5 during June and the Commission on June 22 released from the reservoir the first discharge of water through the spillway to the Swift River below Winsor Dam.

The Swift River diversion tunnel was closed August 7, 1939 and storage first started in the main reservoir during the period until a total storage of 411,600,000,000 gallons was reached. There have been the following yearly releases to the Metropolitan water district from the reservoir:

1941 . . .	20,461,500,000
1943 . . .	17,020,400,000
1945 . . .	22,007,800,000
1946 . . .	10,745,000,000
	70,234,700,000

From the Ware River during this seven-year period, there were the following yearly diversions to the Metropolitan water district:

1939 . . .	541,600,000
1940 . . .	1,857,700,000
1941 . . .	2,000,000
1942 . . .	554,700,000
1944 . . .	1,359,000,000
1946 . . .	169,700,000
	4,484,700,000

Since the completion of the Quabbin Aqueduct and the Swift River Diversion Tunnel there were two periods of excessively high water, the fall hurricanes of 1938 and 1944. The work of the Commission has aided materially in reducing flood damages on the Ware, Swift and Chicopee rivers and with a plan of operation co-ordinating the release from Wachusett Reservoir which has been established, it will provide a potent means of further reducing the effect of flood waters.

During the year the Commission requested, and secured, permission of the Department of Public Health to divert the flow of the Ware River in excess of 85 m.g.d. from the period between June 10 and November 15. However, no diversion was made.

Reforestation of the watershed area was carried on as was the clearing before the rising waters of the reservoir using the boats "Enfield" and "Greenwich" to transport workmen. Work in the suppression of gypsy moth and white pine blister rust was undertaken in cooperation with the U. S. Department of Agriculture.

The Commission reports no extensive fires on the watershed area during the year. The fire lanes and access roads were maintained and forest fire-fighting equipment kept in readiness during the periods of fire hazards.

The collection of water samples from the reservoir, as well as entering streams and the Ware River, was continued. Analyses of these samples were made at the laboratory at the Administration Building, Belchertown and stream gauging stations were continued in cooperation with the U. S. Geological Survey on the Ware, Swift, Chicopee and Connecticut rivers.

Topographical and real estate surveys were being completed and data collected relative to the water supply of the cities and towns in the Ware, Chicopee, Connecticut and Millers River valleys for use of the Special Legislative Committee as well as topographical surveys for the same.

The Metropolitan police has continued its headquarters in the Administration Building and the Commission has maintained the building as well as Shaft 12 and the Outlet Building. Full use by the public of the roads to and over the dam and dike and parking space on Quabbin Hill has been permitted and the Observation Tower and convenience stations available for use.

The Commission awarded to the lowest bidder, after publicly advertising for bids, a contract for the installation of the hydro-electric equipment at Winsor Dam Outlet Works.

The Commission acquired 12 acres of land in New Salem during the year making possible better access for fire lanes and an access road to the Prescott Peninsula.

Quabbin Park Cemetery was maintained and cared for and 31 interments were made therein during the year. As usual, Memorial Day services were held by the veterans on that day.

III. Ware River Supply

The Commission continued the maintenance of the Intake Building and Shaft 8 at Coldbrook and the Outlet Building and Shaft 1 at Oakdale. The Commission granted further locations to the U. S. Army Engineers for making borings for the location of Barre Falls Flood Control Dam. The Commission instructed the Chief Engineer to fully investigate the design of the proposed dam as it was prepared by the Army engineers and to report to the Commission the progress that is being made on the same. The Commission received written assurance that the storage would be released at such times and in such manner as would not affect the rights of the Commonwealth nor the amount of water that could be by law diverted by the Commission.

Maintenance of the Outlet Building at Shaft 1 at Oakdale and the Intake Building and Shaft 8 at Coldbrook and the grounds was continued and Quabbin Aqueduct kept ready for operation.

Minor repairs to the disc-valve at Shaft 8 were completed and an inspection of the aqueduct from Shaft 12 at Quabbin Reservoir to Shaft 4 at Rutland was made by the engineers.

Studies were continued of the plans for a connection to the Holden-Rutland sewer to dispose of the sewage from the towns of West Boylston and Boylston, funds for the construction of such a connection having been provided for by the Legislature of 1946 by Chapter 515 of the Acts of that year.

Operation of the Rutland-Holden Trunk Sewer was continued and with the acceptance formally in September by the town of Rutland the full functioning of that entire system was possible.

The Commission authorized the preparation of plans and specifications for a water wheel and appurtenances to develop electrical energy at the Outlet Building, Oakdale.

IV. Hultman Aqueduct

The Commission instructed the Chief Engineer to secure data relative to the discontinuance of the Old Arched Viaduct which carried the Wachusett Aqueduct across the Assabet River. In view of the fact that this structure provided the sole means of getting the supply from Wachusett and Quabbin reservoirs to the Metropolitan water district and had presented a vulnerable target all during the war period for sabotage, it was clearly apparent that it should be eliminated. Upon the receipt of the report of the Chief Engineer and upon his recommendation the Commission approved the plan and specifications and publicly advertised a contract for the construction of an inverted siphon under the river thus removing the hazard to the supply to Boston. A contract was awarded for the construction of the same to the second lowest bidder, the low bidder not having complied with the specifications in not presenting adequate plans to safeguard by-passing of the aqueduct flow.

Maintenance of the aqueduct and building at Marlborough and Norumbega Reservoir and the right-of-way was continued. Discharge of water directly from Wachusett Reservoir through the aqueduct and by-pass to Weston Aqueduct mains was continued.

The Legislature appropriated the sum of ten million dollars for the construction of the City Tunnel from Charles River to the Chestnut Hill Pumping Station and for the construction of a distribution reservoir and other works. The Commission had already approved the plans and specifications for the construction of the City Tunnel, so called, and immediately approved the contract form and publicly advertised for bids to be opened October 30.

Work under a contract for sub-surface investigation for borings in the counties of Middlesex, Norfolk and Suffolk was completed and additional information obtained at City Tunnel shaft sites, the site of the Blue Hills Reservoir and Waban Hill Reservoir.

The Commission, in view of its recommendation to the General Court in its last annual report advising of the necessity of having a secure delivery of a safe and adequate supply of water under pressure due to the increasing chance of mechanical failure of the old pumps at Chestnut Hill Pumping Station and the immediate increased demand by other communities for water, is prepared to go forward with the work rapidly.

Topographical surveys have been made in the Blue Hills Reservoir area and along the line of the proposed connecting pipe line and of other new connections to existing distribution reservoirs.

V. Litigation

The Ludlow Associates have filed Exceptions in its petition against the Commission for damages caused by the diversion of the Swift River and the office of the Attorney General represents the Commission. The arguments have not been heard by the Honorable Court.

The Commission prepared and furnished such data and exhibits as were requested by the Attorney General for use in the preparation of the Commonwealth's Brief.

VI. Fiscal

Under the provisions of Chapter 541 of the Acts of 1941 the Commission submitted to the Budget Commission estimated expenditures for the allotment periods of the fiscal year.

VII. Other Reports

The Commissioners, as members of the Special Legislative Committee under Chapter 59 of the Resolves of 1945 for the investigation of the Neponset Valley, joined in the report of that committee and also under Chapter 83 of the Resolves of 1945 joined in a report filed by that committee. The members also join in the report of the enlarged water commission engaged in carrying out the provisions of Chapter 705 of the Acts of 1945 filed with the Great and General Court.

The Commission appends hereto a statement of the expenditures and disbursements for the fiscal year, and from the date of its appointment.

Respectfully submitted,

WM. T. MORRISSEY, *Chairman*
JOHN R. SHAUGHNESSY, *Associate Commissioner*
LOUIS B. CONNORS, *Associate Commissioner*

20 Somerset Street, Boston, Massachusetts.
January 8th, 1947.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

Gentlemen:—The following is a report of the engineering department for the year ending June 30, 1946. There are included certain statistical and other data covering the calendar year:

Miscellaneous work was continued on the reforestation of Quabbin Reservoir watershed lands, access roads and fire lanes and fencing, and on seasonal clearing ahead of the water level which on May 30 reached Elevation 528, the level of the masonry sill of the stop-log section of the Winsor Dam Spillway. Work was commenced on the installation of a waterwheel to generate electric power at Winsor Dam, which had been delayed on account of the war. Pending the completion of construction, the various completed portions of the Quabbin Reservoir works, the Quabbin Aqueduct and the Hultman Aqueduct have been maintained.

The plans and specifications were completed for the extension of the Hultman Aqueduct to Chestnut Hill by means of a deep rock tunnel, and for the construction of a siphon to bypass the Assabet-Bridge section of the Wachusett Aqueduct. Work was continued on the Metropolitan sewerage projects. Construction was commenced of the sewage treatment plant on the South Metropolitan System at Nut Island. Designs were in progress for the storm relief sewer in Alewife Brook, and studies underway for marginal relief conduits along the Charles River Basin.

The engineering organization was materially increased during the year.

Organization

Stanley M. Dore, Assistant Chief Engineer, continued to act as deputy chief.

Walton H. Sears, Mechanical Engineer, continued in charge of designs and specifications for plant and equipment.

Frederick W. Gow, Division Engineer, continued in charge of the Reservoir and Aqueduct Division.

Lawrence M. Gentleman, Associate Civil Engineer, continued in charge of the detail work on design and contract and working drawings.

From time to time, the Commission employed the services of consulting engineers: Metcalf & Eddy of Boston, Greeley & Hansen of Chicago, James F. Sanborn of New York, and others.

The assignment of employees under the direction of the Chief Engineer at the end of the fiscal year and of the preceding year was as follows:

	June 30, 1945	June 30, 1946
Headquarters, Designing Division		
20 Somerset Street, Boston	37	52
Reservoir and Aqueduct Division		
Administration Building at Winsor Dam, Belchertown	20	24
Ware River Intake Building, Coldbrook	11	11
City Tunnel Office, 107 Charles St., Auburndale	23	67
Total Engineering Force	91	154

Headquarters Office

Watershed Real Estate.—The total area of real estate acquired for Quabbin Reservoir to June 30 is 80,961 acres, of which 12 acres were acquired during the year in the Town of New Salem. Settlements have been secured covering 79,239 acres.

The total area of real estate acquired for sanitary protection in the Ware watershed to June 30 is the same as previously reported, 21,097 acres. Settlements have been secured covering 19,915 acres.

The previous published Annual Report contains a table showing all real estate takings for the Quabbin Reservoir and Ware development.

Hultman Aqueduct and City Tunnel Real Estate.—During the year, no additional takings of real estate were made for the City Tunnel. Of a total of 563 acres of land taken in fee and easement for the purposes of the Hultman Aqueduct, including the City Tunnel, settlements have been secured covering 560 acres.

Nut Island Sewage Treatment Plant Real Estate.—During the year 12 acres of real estate were acquired for the Nut Island Sewage Treatment Plant in Quincy.

Water Diversion Damage Claims.—Only incidental work was done on data in connection with the suit brought by the Ludlow Manufacturing Associates. Their appeal to the Supreme Court for adjudication of exceptions in the case which resulted in a verdict favorable to the Commission is still pending.

Record Drawings.—Work was continued on the record drawings of the Hultman Aqueduct.

Hydrographic Data.—Gaging stations were continued in cooperation with the United States Geological Survey on the Ware River at Coldbrook, on the East Branch of the Swift River at the regulating dam, on the Chicopee River at Indian Orchard, and on the Connecticut River at Thompsonville, Connecticut. Level recorders were also maintained by the Commission on the Chicopee River at Red Bridge and on Beaver Brook south of Quabbin Dike.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken.

Maintenance of Records.—Records of assignments of lots and interments in Quabbin Park Cemetery were maintained. Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements. Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

CONTRACTS AND SPECIFICATIONS

Plans and specifications were prepared for the following contracts for which bids were opened during the fiscal year:

Contract 133, for constructing an inverted pipe siphon on the Wachusett Aqueduct at the Assabet River in the Town of Northborough.

Six bids were received May 1, ranging from $160,377.90 to $302,312.67. The bid of the low bidder was based on a plan for bypassing the aqueduct flow which lacked the safeguards required in the specifications. The contract was executed August 28, 1946, for $197,758.00 with Berke-Moore Company, Inc., Brookline, Mass., the next to the lowest bidder.

Contract 134, for making wash and core borings in the Counties of Middlesex, Norfolk and Suffolk, to complete the investigations for the location of the City Tunnel section of Hultman Aqueduct, and its future extensions.

Two bids were received July 3, 1945, for $8,492.25 and $12,751.20. The contract was executed August 9 with Sprague & Henwood, Inc., Scranton, Pennsylvania, the lower bidder.

Contract 136, for constructing earthwork, excavation and fill, at and near Nut Island in the City of Quincy, to prepare the site of the sewage treatment works at the terminus of the South Metropolitan Trunk Sewer.

Eight bids were received September 27, 1945, ranging from $478,814.38 to $979,363.35. The contract was executed October 18 with V. Barletta Company, Roslindale, Mass., the lowest bidder.

Contract 138, for making soundings on the location of the sludge disposal line from Nut Island to President Roads in Boston Harbor in the Town of Hull, and the cities of Quincy and Boston. Only one bid was received November 8, 1945, for $14,717.50. The contract was executed November 28 with the Greenland Drilling Company, Teaneck, New Jersey, the only bidder.

Contract 141 (*A, B*), for furnishing and delivering engines, generators, blowers and pumps for the Nut Island Sewage Treatment Plant in the City of Quincy. Bids were received February 13:

(A) Three bids were received for two 5,000 C.F.M. dual fuel engine-driven blowers, two 750 K.V.A. dual fuel engine-driven generators and one 750 K.V.A. gas engine-driven generator, for $194,778.00. $247,860.00 and $259,372.00. The request of the low bidder, in view of price increases, that he be allowed to withdraw his bid thirty days after the opening, was granted by the Commission, which required this time to investigate the various types of engines submitted and to have the existing installations inspected and their performances tested.

(B) Two bids were received for four mixed-flow type sewage pumps for $91,239.00 and $162,614.00.

In addition bids were received for the combination of both groups A & B, the lowest for any such combination being $330,374.00. The contract was executed in that amount May 31, with the Worthington Pump and Machinery Corporation, Harrison, New Jersey, the low bidder for the combination.

Contract 142 (*A, B, C, D, E, F, G, H,*), for furnishing and delivering grit and sludge removal equipment, bar screens and comminutors for the Nut Island Sewage Treatment Plant in the City of Quincy. Bids were received January 9:

(A, B) Three bids were received for six grit collectors and one grit conveyor, ranging from $23,146.00 to $32,180.00.

(C) Two bids were received for one grit hopper, two grit washers and two grit elevators, for $16,028.00 and $17,200.00.

(D, E) Four bids were received for twenty-four sludge and scum collectors and six sludge cross collectors, ranging from $67,997.00 to $78,650.00.

(F, G) Three bids were received for six scum cross collectors and three scum conveyors, ranging from $15,499.00 to $21,674.00.

(H) Only one bid was received for two medium mechanically cleaned bar screens and three fine mechanically cleaned bar screens, for $15,257.00.

The contract for all these groups A to H, inclusive, was executed in the amount of $137,927.00, March 26, with the Jeffrey Manufacturing Company, Columbus, Ohio, the lowest bidder for each group and for the total.

Contract 142 (*I*), for furnishing and delivering six comminutors for the Nut Island Sewage Treatment Plant in the City of Quincy. Only one bid was received January 9, for $40,244.00, subject to increase with OPA approval by not more than $4,000. The contract was executed March 19, with the Chicago Pump Company, Chicago, Illinois, the only bidder.

Contract 144 (*A, B, C, D, E, F, G*), for furnishing and delivering cranes, hoists, meters, aeration system, digestion tank equipment and chlorinators for the Nut Island Sewage Treatment Plant in the City of Quincy. Bids were received May 1:

(*A, B*) Only one bid was received for one 7½-ton traveling crane, three short-span traveling cranes, one chain hoist and three electric hoists, for $12,105.28, subject to increase with OPA approval by not more than $1,428.68. The contract was executed September 17, 1946, with Robert Abel, Inc., Boston, Mass., the only bidder.

(C) Bids for two alternate types of diffuser tube aeration systems were received from only one bidder for $33,954.00 and $40,230.00, respectively. The contract was executed September 16, 1946, for $33,954.00 with the Chicago Pump Company, Chicago, Illinois, the only bidder.

(D) Only one bid was received for one 120-inch and two 6-inch Venturi meters, for $10,831.00. The contract was executed September 17, 1946, with Builders-Providence, Rhode Island, the only bidder.

(E, F) Only one bid was received for two secondary digestion tank covers and six supernatant selectors, for $55,088.00. The contract was executed October 3, 1946, with the Pacific Flush Tank Company, Chicago, Illinois, the only bidder.

(G) Two bids were received for chlorinating equipment, for $47,806.00 and $48,927.00. The bid of the low bidder did not meet the requirements of the specifications. The contract was executed September 23, 1946, with Wallace & Tiernan Company, Inc., Newark, New Jersey, the next to the lowest bidder.

Contract 147, for construction of bituminous surfacings on Sea Avenue and Island Avenue in the City of Quincy.

Two bids were received May 15, for $15,288.81 and $16,776.10. The contract was executed June 27, with V. Barletta Company, Roslindale, Mass., the lower bidder.

Contract 150, for installing the hydro-electric power plant and completing the installation at the Winsor Dam Outlet Works in the Town of Belchertown.

Two bids were received February 27, for $39,198.10 and $62,564.60. The contract was executed March 27, with Berke-Moore Company, Inc., Brookline, Mass., the lower bidder.

Design

Studies and designs were continued of structures proposed to be constructed but not yet bid, as follows:

Power Development at Quabbin Aqueduct. Studies were continued of the development of power in the new station at the outlet works of Quabbin Aqueduct in the Town of Oakdale.

Wachusett Watershed Protection. Studies were continued in cooperation with the Quabbin Reservoir and Aqueduct Division of a system for diverting from the watershed of Wachusett Reservoir the sewage of Boylston and West Boylston.

Hultman Aqueduct—City Tunnel. Plans and specifications for the extension of the Hultman Aqueduct by the City Tunnel from Shaft 5 at the Charles River to Chestnut Hill were practically completed, and the contract for sinking two construction shafts was advertised for the opening of bids on October 30, 1946. Miscellaneous studies were continued of plans for the proposed future extension of the City Tunnel.

Distributing Reservoirs. Studies and designs were continued for the modification of, and new connections to, existing distributing reservoirs, which must follow the completion of the City Tunnel; and also for an additional distributing reservoir in the Blue Hills Reservation.

Barre Falls Flood Control Project. Studies were continued of the effect of the flood control project which the Federal Government is planning to construct at Barre Falls in the Ware River watershed. The Chief Engineer of the Commission continued as a member of an advisory board to assist the State Planning Board in its studies and recommendations to His Excellency the Governor on this and other similar Massachusetts projects. Agreement was reached with representatives of the United States Engineer office in Providence, Rhode Island, as to the general features which will govern the design of the Barre Falls Flood Control Project.

Neponset Valley Investigation. Assistance was rendered to the joint board for studying methods to improve the conditions of the Neponset Valley in the preparation of its report filed with the legislature of 1946.

Enlargement of Metropolitan Water District. Further studies were made and data assembled for assistance of legislative committees in the preparation of amendments clarifying recently enacted provisions affecting the conditions of entrance into the Metropolitan Water District, reducing the annual assessment commencing in 1946 to a flat rate of $40 per million gallons and encouraging new cities and towns to join.

Chicopee Valley Water Supply. Studies were made and considerable data assembled for, and assistance rendered to, the Special Commission to investigate the water supply needs of municipalities in the valley of the Connecticut River and its tributaries. The studies included the possibility of supplying these communities with water from Quabbin Reservoir.

Sewerage Projects

Studies were continued on the five sewerage projects authorized in Chapter 705 of the Acts of 1945, for the improvement of the Metropolitan Sewerage Systems, actual construction being confined to the project for the Nut Island Sewage Treatment Plant. Work was commenced on the preparation of plans for the Alewife Brook Storm Relief Sewer Project.

Project 1—*Nut Island Treatment Works.* Sufficient progress was made on the designs for the proposed sewage treatment plant at Nut Island so that plans and specifications were practically completed for the construction of the aeration and sedimentation tanks, influent and effluent conduits, grit channels and main building substructure, which contract was advertised for the opening of bids July 31, 1946; and also for the construction of a digested sludge outfall and of diffusers over the outlets of two of the existing outfalls, which contract was advertised for the opening of bids October 16, 1946. The plan of the works is outlined in a flow diagram published in the previous report.

South Metropolitan Sewage Records. The collection of twenty-four-hour composite samples at about 8-day intervals for analysis of the amount of suspended solids was continued.

Project 3—*Alewife Brook Storm Overflow Conduit.* Studies were commenced of the conditions in the valley of Alewife Brook and the amount of sewage reaching the brook in storm overflows.

Projects 4 *and* 5—*Charles River Basin Storm Overflow Conduits.* Investigaitons were continued of conditions along both sides of the Charles River. An investigation of the conditions at Galen Street overflow was made on February 1, and recommendations to the town of Watertown resulted in the cleaning of that town's siphon pipe under the Charles River on May 9 and 10. Studies were made of the installation of floating booms at the outlet of Salt Creek and elsewhere to prevent the entrance into the Charles River Basin of oil and other objectionable floating material from the storm drains.

Boston Marginal Conduit. The recording levels at the Fens Gatehouse was continued and studies made looking to an alleviation of the condition of clogging by debris from the larger Stony Brook Conduit of the City of Boston.

Cambridge Marginal Conduit. The recording of levels at the Charles River Dam gatehouse was continued.

Reservoir and Aqueduct Division

The Quabbin Reservoir and Aqueduct Division continued in charge of all field work. This consisted of: Topographic and real estate surveys in the Quabbin Reservoir area, in the Ware River and Wachusett watersheds, along the Hultman Aqueduct, at the site of the proposed distributing reservoir in the Blue Hills, and in connection with the various sewerage projects; reforestation; reservoir reclearing and work on fire lanes and access roads; the work of the water analysis laboratory; investigations in the Chicopee River Valley; the collection of data on flow in the South Metropolitan Trunk Sewer and the collection and analysis of sewage samples; and the maintenance and operation of Quabbin Park Cemetery, the Quabbin Reservoir release works at Winsor Dam, the Ware River Intake Works at Coldbrook, Quabbin Aqueduct and Hultman Aqueduct.

Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the Intake Building at Barre, and daily rainfall records at Pelham, at Nichewaug and Harvard Forest in Petersham, at South New Salem, at North New Salem, at West Rutland and at the Quabbin Aqueduct Intake in Hardwick. Daily rainfall and temperature records were kept at the Administration Building at Belchertown. Continuous records were kept of the flow of the Swift River at Winsor Dam. The accompanying table shows the monthly rainfall during the calendar year 1946 at stations on the Ware and Swift watersheds. Work was continued in the field offices on record plans in the Reservoir Area and along the Hultman Aqueduct.

The Department of Public Health continued its cooperation in the analysis of samples of water.

Quabbin Hill Building and the scenic highway between Winsor Dam and Quabbin Dike and the Quabbin Hill Observation Tower were reopened to the public July 15, 1945, following the expiration of the war emergency. The area was again closed for the winter season December 29 and reopened March 16.

The Belchertown office continued its records and management of the affairs of the former towns of Dana, Enfield, Greenwich and Prescott. Policing of the Quabbin Reservoir area was continued by the Metropolitan Police who were housed in the Administration Building. Miscellaneous surveys included the location of power lines for the new residences and for the United States Army target controls. The work of constructing two new residences for engineering personnel on Blue Meadow Road was continued with lumber and other materials salvaged from various buildings in the reservoir area. To obtain a suitable water supply, a well was drilled by the Wachusett Artesian Well Company, October 6 to October 9, 1945. The well was drilled to a depth of 170 feet and produced a yield of four gallons per minute. Residence No. 1 was completed and occupied November 6. An average of 5 men were employed April 23 to June 10, in order to complete the grading and loaming around the Quabbin Hill Observation Tower. Other miscellaneous items of construction were completed by force account, including the entrances to the east access road, the surfacing with asphalt emulsion of the access roads to the East and Middle Branch Regulating Dams and other access roads totaling 7.3 miles, and the construction of a temporary measuring weir in the lower spillway channel.

Investigations were made of the water supply systems of towns in the Chicopee River Valley in connection with studies for the Special Legislative Commission investigating their needs.

After the reservoir filled to the level of the lower spillway crest, many tests were made to determine the rating of the flow through the stop-log bays in the depressed section of the Winsor Dam Spillway.

Plans and studies were continued by the Coldbrook office of methods for disposing sewage in the towns of Boylston and West Boylston in the Wachusett watershed. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct. The chlorinating station on Mill Brook below the Central New England Sanatorium was maintained.

The Newton Office completed a topographic survey of the proposed distributing reservoir in the Blue Hills area, and a profile along the proposed connecting pipe line was made. Wash borings and soundings were made by force account to investigate subsoil conditions for the proposed Assabet Siphon on the Wachusett Aqueduct. Sewage level gages were continued on the South Metropolitan Sewer at the Fens Gatehouse of the Boston Marginal Conduit, and at the Charles River Dam chamber of the Cambridge Marginal Conduit.

Inspections were made of conditions along the Stony Brook Conduit permitting the entrance of debris into the conduit. Surveys were made of the Galen Street siphon of the Town of Watertown to determine the extent of clogging resulting in abnormal overflows of sewage into the basin. Extensive surveys were made in the valley of Alewife Brook to determine the location of existing sewers and connections and other underground structures, and the extent and character of contributions from sewage and storm water from various sources.

Reforestation. The general program of reforestation was continued with stock from the Commission's nurseries, as indicated in the following table which is a continuation of the information published in previous reports.

Quabbin Watershed.

Nursery Work in 1946	April 10 to May 16
Average Force	2 men
Broad Planting in 1946	April 10 to May 2
Average Force	5 men
Acres Planted	80
Cost per M for planting	$8.45
Survival to Date	75%
Red Pine, 6-year transplants	500
Hemlock, 5-year transplants	70,700

No planting was done in the Ware watershed. 10,000 red pine 6-year transplants together with a small number of miscellaneous trees and shrubs were taken to Norumbega Reservoir and used to replace trees that had been destroyed by fire. Also approximately 44,000 transplants were transferred to the Water Division of the Metropolitan District Commission or sold to individuals. The summary of stock in the nursery on June 30, 1946, in addition to about 280 miscellaneous trees and shrubs, is as follows:

Six-year seedlings	(6-0)	1,900,000
Seven-year seedlings	(7.0)	1,900,000
Eight-year seedlings	(8-0)	5,000
Six-year transplants	(3-3)	250
Seven-year transplants	(2-5)	675,000
Eight-year transplants	(2-6)	2,900,000
Total		7,380,250

Practically all of these trees are now too large for economical use for watershed planting, and will be left to grow in their present locations and considered as permanent stands.

The work on gypsy moth control by roadside spraying on the Prescott Peninsula with arsenate of lead solution was continued until July 13, 1945. Work was started on April 29 on white pine blister rust control in cooperation with the United States Department of Agriculture and continued throughout the year covering an area of approximately 14,000 acres. An average of 4 men were so employed on force account for 10 weeks.

Floating Equipment.—The use of the Commission's two largest boats, the "Enfield" and the "Greenwich", was continued for the transportation of workmen and their equipment to various sections of the reservoir for taking water samples and general utility work. The "Dana" remained in storage. The New England Power Company was permitted to house and use a boat to facilitate the maintenance of its 110,000-volt transmission line crossing the reservoir.

Experimental Grazing.—The flock of sheep pastured on experimental grazing areas increased during the year from 50 to 66. The Commission's experiment with this flock during the last six years had definitely indicated no economy in its maintenance. Accordingly on June 24, the entire flock was disposed of by sale to the Gardner State Hospital. 320 pounds of wool was sheared during the year.

Fire Protection.—Fire fighting equipment was maintained and ready for service at all times, one fire truck being stationed at Pelham Hill on the west side of the reservoir, one at Nichewaug near the reservoir intake to Quabbin Aqueduct, one near the Ware River Intake Works, and the remainder of the fire fighting equipment at the Administration Buildings. During the year the equipment and personnel responded to calls for assistance at three forest fires in the Quabbin area which burned over only 1 acre above the flow line and ¼ acre below, and three forest fires in the Ware watershed which burned over a total area of 14 acres. The United States Army continued its fire boat and fire fighting equipment at the bombing range base and rendered effective aid. Work on fire access roads and reclearing fire stops was continued by force account. An average of 8 were so employed for 32 weeks.

Quabbin Park Cemetery.—A small labor force averaging 5 men was employed on cemetery work throughout the year. The vault was maintained ready for use, cemetery lots graded and seeded as required, the entire cemetery area properly maintained and driveways plowed and kept clear of snow throughout the winter months. Thirty-one interments were made during the year.

Rutland-Holden Sewer

The Rutland-Holden Sewer was in continuous operation throughout the year. The entire length of the line and the meter stations at the Rutland State Sanatorium, at the United States Veterans' Hospital in Rutland, at the Rutland-Holden boundary line and at the Holden-Worcester boundary line were inspected regularly.

The Rutland sewer system which was constructed under the Commission's agreement with the town in cooperation with the Federal Works Progress Administration was accepted by the town September 17, 1945.

Laboratories

Park Road Laboratory—Weston.—The Commission's loboratory for soil testing was continued with equipment previously moved from Belchertown to Weston. In the same building the analyzing of sewage samples was continued. This included the periodic testing throughout the year of composite 24-hour samples from the South Metropolitan Sewer at Nut Island, also the periodic testing of samples from Alewife Brook and from the Stony Brook Conduit.

Water Analysis Laboratory—Belchertown.—The taking and analyzing of samples from the Ware, Swift, Quaboag and Chicopee rivers was continued. The chemical and bacteriological analysis of the regularly scheduled samples from Quabbin Reservoir and tributary streams in the Swift and Ware watersheds was continued. The work has been under the general supervision of Clarence H. Reed, Assistant Superintendent of the Sudbury Section of the Metropolitan District Commission.

Operation of Winsor Dam Outlet Works

The outlet works were maintained, and pending the completion of repairs to the control valves the required release of water was controlled over stop shutters in the intake building until the filling of the reservoir provided sufficient head over the main dam spillway to transfer the release to that point. Studies of the best method of repairing cavitation particularly in the large 48" valve, which had served its purpose of carrying the entire flow of the river during and immediately following the construction of the Winsor Dam diversion tunnel plug under Contract 52, indicated it was unduly expensive to substitute a smaller valve and to purchase special castings required to make the necessary alterations. Accordingly, satisfactory repairs were made by force account. Pending the completion of the waterwheel installation, which had been delayed on account of the war, the heating of the building was continued by the use of the hot air furnace previously transferred from the Quabbin Park Cemetery building. On August 31, 1945, an inspection was made of the accessible portion of the tunnel under the west dam abutment originally used for river diversion during construction.

Operation of Quabbin Aqueduct

The Reservoir intake works at Shaft 12 of Quabbin Aqueduct, the Ware River intake works at Shaft 8, and the outlet works at Shafts 1 and 11A were kept ready for operation with the fine racks in place at Shafts 12 and 8, and with an auxiliary rack on the invert at the bottom of the tunnel at Shaft 9.

The Coldbrook office constructed by force account between September 12 and October 11, 1945, the catwalk on the south and east sides of the Ware River Intake Building to make it easier to clean, during operation, the coarse outer racks on the siphon spillway intakes. Also repairs were made July 24 to October 30, 1945, on the trunion bearings of the main 72" Dow-disc valve. The work consisted of dismantling the valve, removing the trunion shaft and bearings, turning down and metal spraying the ends of the trunion, and installing new bushings keyed to the housing.

The heating system in the Intake Building was changed from coal back to oil in October 1945. The tunnel was entered and inspected between Shaft 12 and Shaft 4 on October 16, 17 and 18, 1945. The tunnel lining was found to be in very good condition.

Operation of Hultman Aqueduct

The discharge of water directly from Wachusett Reservoir through the new Hultman Pressure Aqueduct and through the 7-foot diameter bypass into the Weston Aqueduct supply mains was continued throughout the year. The Hultman Aqueduct intake works in Marlboro, the control works at Shaft 4 below the Sudbury Dam, and the Norumbega Reservoir gatehouse and emergency chlorinating plant were maintained with the fine racks in place at the intake, and fine screens in the Norumbega gatehouse.

Progress of Construction Contracts

Contract 134.—Contract 134, for making wash and core borings in the Counties of Middlesex, Norfolk and Suffolk was started July 30, 1945. To obtain additional information at the City Tunnel shaft sites, 862 feet of core borings were made; at the site of the proposed Blue Hills Reservoir, 265 feet of core borings; and at the District's Waban Hill Reservoir, 341 feet of wash borings. All the work was completed December 13, 1945.

The Final Estimate, dated January 24, 1946, was for $8,275.17. The Contractor's force varied from 2 to 4 men.

Contract 136.—Contract 136, for earthwork consisting of excavation and fill at the site of the Nut Island Sewage Treatment Plant in the City of Quincy, was started October 30, 1945, and continued throughout the year. The placing of Class B embankment was started November 19 with material hauled from gravel pits in Weymouth and Quincy. Placing of fill was started at the southeasterly end of the present causeway leading to the Nut Island screen house. As the fill progressed out into the harbor area, the accumulated mud wave in front of it was blasted with light charges to aid its removal. Placing of Class A embankment was started March 19 with suitable heavy material from the required excavations on Nut Island and from the south shore borrow pits. Excavation for the proposed digested sludge tanks and plant buildings was started the latter part of March and was substantially completed by the end of the year. Removal of riprap along the east side of the causeway was started March 13, and practically completed at the end of the year. This material was placed as riprap on the outer face of the new fill, starting April first. Additional riprap was hauled from quarries in Quincy. The work of preparing the site was about 60% completed at the end of the fiscal year. The existing water mains serving the Nut Island screen house and the United States Government Plant on Peddocks Island, and the electric lines serving the Houghs Neck pumping station were relocated as required. The new 60" offshore outlet drain was constructed of pre-cast sections and about 60% completed at the end of the year. The Contractor was authorized to construct the foundation for rebuilding Sea Avenue in Houghs Neck as required for a permanent access road. This work was done April 29 to May 9. The entire work of the contract was about 82% completed at the end of the year, on June 30.

The value of work included in contract estimates during the year was $389,383.42, of which $350,445.08 has been approved for payment. The Contractor's force averaged about 40 men, the maximum being 114 for the week ending February 23.

The principal items of equipment used were:

2	Bulldozers
3	1½-Yd. Shovels
1	Crane with drag line for clamshell attachment
1	Grader
1	Tractor with 6-Yd. dump wagon

In addition to maintenance equipment, he used a maximum of 83 trucks for any one week in hauling the fill.

The total work done and materials furnished to date under the principal items of Contract 136 are as follows:

5,250	cubic	yards	of existing stonework protection removed
37,719	"	"	of excavation
246,222	"	"	of embankment
2,552	"	"	of crushed stone and screened gravel
11,642	"	"	of sand or gravel
10,207	"	"	of riprap

Contract 138.—Contract 138, for soundings on the location of the sludge disposal line from Nut Island to President Roads was started November 26, 1945, and completed March 1. From the floating equipment 154 soundings were made for an aggregate depth of 1477 feet. In addition, 11 wash borings were made for an aggregate depth of 153 feet. The Final Estimate, dated March 11, 1946, was for $15,488.95. The Contractor's force averaged 4 men.

The Contractor used a 50-foot boat with an A-frame on a platform on the stern for his borings and soundings on water.

Contract 147.—Contract 147, for surfacing Sea Avenue and Island Avenue in the City of Quincy, as permanent access roads to the Nut Island Sewage Treatment Plant was started May 25, and continued throughout the year. Work on Sea Avenue consisted of fine grading and rolling and of placing the base course of crushed stone, replacing broken cross drains, raising manhole and catch basin covers to grade and surfacing. This was completed during the first week in June. The work on Island Avenue consisted of minor grading and replacing broken drains. Placing of the surfacing was delayed by the necessity of getting approval of abutting owners on this private way. At the close of the year, the work on Island Avenue was about 64% complete.

The value of work included in contract estimates during the year was $9,830.96, of which $8,847.86 has been approved for payment. The Contractor's force averaged 11 men with a maximum of 18 for the work on Sea Avenue.

The principal items of equipment used were:

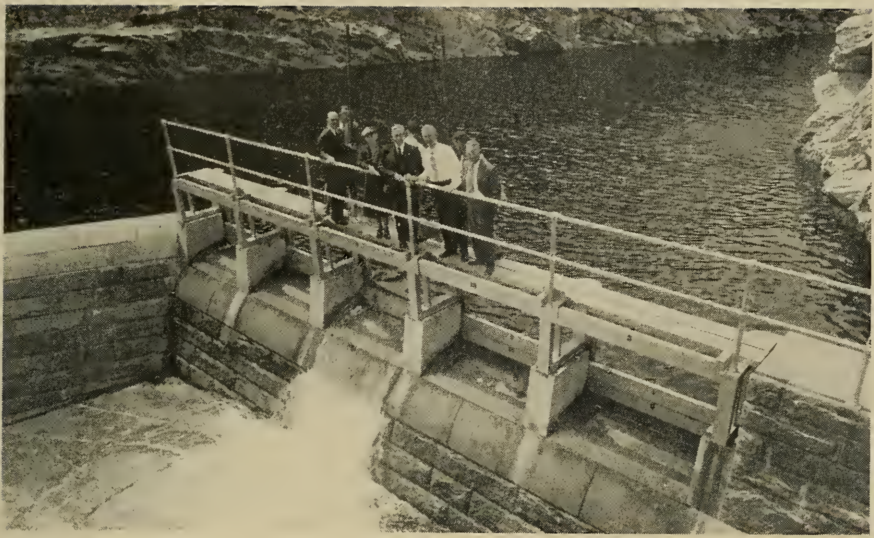
1	Bulldozer
1	1½-Yd. shovel with ¾-Yd. bucket
1	Grader
1	Paving machine
3	Road rollers up to 16 tons
7	Trucks

Contract 150.—Contract 150, for installing the hydro-electric equipment in the Winsor Dam Outlet Works at Belchertown was started March 7, and continued until April 13 when the work was suspended to await the delivery of further equipment furnished under Contract 149. Miscellaneous alterations in existing piping and masonry were 40% completed. Work on the outdoor substation and appurtenances at the rear of the building was about 30% completed, also conduits were installed between the substation and the main building. Work on the erection of the 22,000-volt transmission line was commenced with the clearing of the right-of-way to the New England Power Company's existing line, and was about 20% completed. The entire work was about 13% completed.

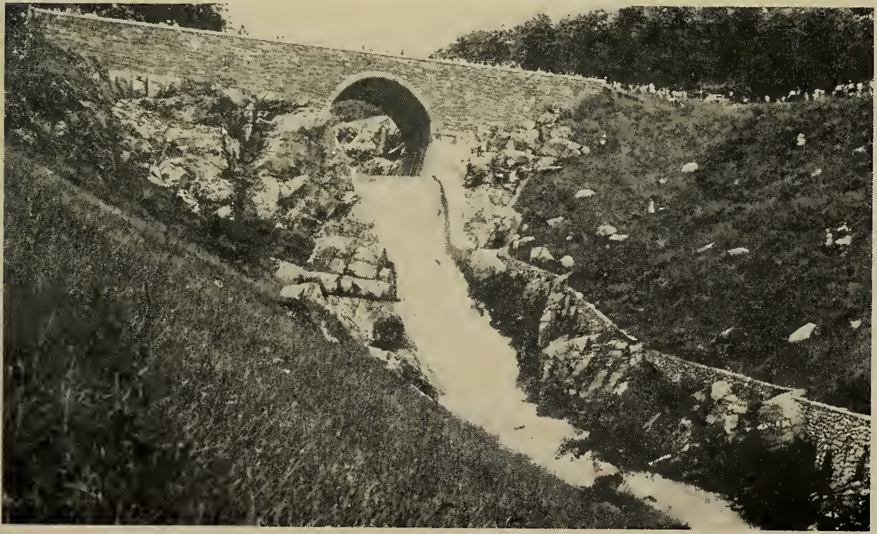
The value of work included in contract estimates during the year was $5,286.00, of which $4,757.40 has been approved for payment. The Contractor's force averaged about 5 men for 5 weeks.

Filling of Quabbin Reservoir

The water level in Quabbin Reservoir reached, on May 31, Elevation 528 above Boston City Base, the elevation of the masonry crest of the depressed section of the Winsor Dam Spillway. On June 22nd, it had reached Elevation 529.05 giving sufficient head to permit the celebration of the filling of the reservoir by the lifting of the stop logs, and the discharge of the first water through the spillway channel to the Swift River below the Dam. Several hundred people attended the celebration. In the forenoon a large group of the Commission's employees and their friends inspected the works, and enjoyed a picnic lunch in the parking area on Quabbin Hill near the Observation Tower.



First Water over Quabbin Reservoir Winsor Dam Spillway, June 22, 1946.



At 2:30 P.M. the stop logs were lifted by Associate Commission Louis B. Connors. Judge Davis B. Keniston, Chairman of the Commission from its inception, May 28, 1926, to December 27, 1934, and Mrs. Frank E. Winsor, widow of the late Chief Engineer, after whom the dam was named, were also present. A sufficient number of logs were removed from the five six-foot bays to permit a discharge at the rate of fifty million gallons daily. A temporary measuring weir of this capacity had previously been constructed in the channel entering the river for the purpose of measuring the discharge, and obtaining an accurate rating curve for low rates of discharge over the spillway. The visitors spent the afternoon in viewing the reservoir from various vantage points along the scenic highway, and particularly the new and beautiful waterfall created by a plunge from the upper to the lower levels of the spillway channel against the background of the 41-foot masonry arch span which carries the highway across the channel.

Storage and Flow Records

Quabbin Reservoir Storage and Release. Storage in Quabbin Reservoir continued. The following is a continuation of the information tabulated in previous reports, and include fluctuations during the entire calendar year 1946. The figures for storage show the quantity above the sill of the lower intake in Quabbin Aqueduct, Elevation 528.00. Below this sill and hence not available for draft to Wachusett Reservoir, there are about 10,000 million gallons above the reservoir bottom.

Elevation on December 31, 1946:

Behind Middle Branch Regulating Dam	530.08
Behind East Branch Regulating Dam	530.21
Main Reservoir	528.58

Intermediate Peaks during 1946:

High Point on July 3	529.46
Low Point on July 20	529.30
High Point on August 19	529.83
Low Point on September 24	528.44
High Point on October 8	528.63
Low Point on December 20	528.34

Million Gallons Available December 31, 1946:

Above the ground contours	390,710
Estimated ground storage	14,610
Total	405,320

At the end of the previous fiscal year June 30, 1945:

Elevation of Main Reservoir	519.92
Total Storage	341,290 M.G.

At the end of the fiscal year June 30, 1946:

Elevation of Main Reservoir	529.36
Total Storage	411,600 M.G.

Drawn to Wachusett Reservoir in 1946:

From	10,745 M.G.
To	August 26 September 13 intermittent

Released in 1946 over spillway and through control works after reservoir reached spillway level, in excess of legal requirements:

June	92 M.G.
July	38 " "
August	72 " "
September	58 " "
October	46 " "
November	37 " "
December	69 " "

Ware River Diversion.—Ware River water was diverted into Quabbin Aqueduct intermittently from November 20, 1945 to June 15, 1946, as shown in the following tabulation which is a continuation, for the entire calendar year 1946, of the information published in previous reports:

Million Gallons Diverted in 1946:

To Quabbin Reservoir	13,383.1 M.G.
To Wachusett Reservoir	169.7 M.G.
Total	13,552.8 M.G.
Maximum in one day	669.2 M.G.
Total in the fiscal year ending June 30, 1946	14,835.0 M.G.
Season Diversion Stopped	June 15 No diversion in 1946, after October 15
Emergency Diversion	No diversion in 1946, June 15 to October 15

Released in 1946, after Quabbin Reservoir reached spillway level, during the diversion period prior to June 15 and after October 15, in excess of legal requirements:

June	934 Mil. Gals.
December	51 " "

Sewage Diversion from Ware River Watershed. The Rutland-Holden Sewer continued in operation. The quantities discharged from the various institutions and towns into the sewerage system of the City of Worcester in the City's fiscal year which coincides with the calendar year, 1946, are as follows:

Rutland State Sanatorium	34,024,000 Gals.
U. S. Veterans Hospital	33,637,000 "
Town of Holden	20,129,000 "
Town of Rutland	5,432,000 "
Total	93,222,000 "

Delivery from Hultman Aqueduct to Distribution System. Pending the extension of Hultman Aqueduct to Chestnut Hill by way of the proposed City Tunnel the limited use of the aqueduct has been continued. The number of gallons delivered to the distribution system monthly during 1946 was as follows:

January	1,895,110,000 Gals.
February	1,957,310,000 "
March	2,022,140,000 "
April	1,947,980,000 "
May	2,031,500,000 "
June	1,923,510,000 "
July	2,136,300,000 "
August	1,992,960,000 "
September	1,956,880,000 "
October	2,058,910,000 "
November	2,050,190,000 "
December	2,235,760,000 "
Total	24,208,550,000 "

The total delivered during the fiscal year ending June 30 was 18,468,390,000 gallons.

List of Drawings and Tables Appended Hereto

Status of Contracts completed during the fiscal year ending June 30, 1946
Status of Contracts in force on June 30, 1946
Canvass of Bids, Contract 133
Canvass of Bids, Contract 136
Canvass of Bids, Contract 137
Monthly Rainfall on Ware and Swift Watersheds 1946

For summaries of rainfall in years previous to 1945, see 1935 to 1945 Annual Reports, inclusive.

Respectfully submitted,
KARL R. KENNISON,
Chief Engineer.

20 Somerset Street, Boston, Mass.
Jan. 1, 1947.

MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHEDS
1946

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
WARE WATERSHED													
Ware River Intake Works*	3.25	3.40	1.90	2.44	5.37	4.97	4.29	4.68	6.54	0.99	1.24	3.07	42.14
West Rutland*	3.39	3.60	1.90	2.52	5.27	4.36	3.74	5.20	7.54	0.96	1.38	3.20	43.06
North Rutland	2.42	2.76	1.10	2.38	5.14	3.32	4.05	4.78	7.17	0.81	1.46	2.88	38.27
Williamsville	2.88	3.53	2.17	2.39	6.01	5.35	4.71	4.56	7.98	1.00	1.13	3.49	45.20
Hubbardston	2.23	3.11	1.75	1.98	5.18	4.11	3.66	4.35	6.37	1.02	1.36	2.33	37.45
1946 Mean	2.83	3.28	1.77	2.34	5.39	4.42	4.09	4.71	7.12	0.96	1.32	2.99	41.22
23-year Mean	3.22	2.81	3.53	3.45	3.57	4.28	4.16	3.63	4.68	3.11	3.61	3.07	43.12
SWIFT WATERSHED													
Administration Building*	3.28	3.66	1.68	2.16	5.75	4.59	4.50	4.70	3.24	0.81	1.03	3.03	38.43
Shutesbury	2.86	3.63	1.55	2.40	7.34	4.29	5.80	5.05	5.79	1.91	1.17	2.61	44.40
Wendell	3.26	4.04	1.42	2.83	7.00	4.22	6.02	4.53	4.71	1.72	0.96	4.12	44.83
Pelham*	2.32	3.60	1.74	2.51	6.87	4.89	4.42	5.06	5.21	1.56	1.12	3.05	42.35
South New Salem*	2.54	3.37	1.98	2.46	6.64	3.50	4.09	4.34	5.15	1.52	0.92	3.47	39.98
North New Salem*	3.13	3.43	1.71	3.08	6.47	4.76	5.15	4.52	5.45	1.61	1.10	3.95	44.36
Harvard Forest, Petersham*	2.97	3.57	1.70	2.39	5.65	7.81	3.96	5.00	4.08	1.10	1.06	3.37	42.66
Nichewaug, Petersham*	2.80	2.97	1.96	2.47	6.18	7.29	3.52	4.02	3.94	0.99	1.43	2.88	40.45
Quabbin Aqued. Intake Wks.*	2.88	3.06	1.97	2.93	6.61	4.14	3.81	4.95	3.96	1.12	1.24	3.57	40.24
1946 Mean	2.89	3.48	1.75	2.58	6.50	5.05	4.59	4.69	4.61	1.37	1.11	3.34	41.96
27-year Mean	3.35	2.82	3.56	3.94	3.75	4.91	4.38	3.87	4.61	3.13	4.09	3.33	45.74

*Station maintained by Metropolitan District Water Supply Commission. Data for stations at North Rutland, Williamsville, Hubbardston, Shutesbury and Wendell furnished by Massachusetts Department of Public Health.

STATUS OF CONTRACTS COMPLETED BETWEEN JUNE 30, 1945 TO JUNE 30, 1946

Contract No.	Description	Contractor	No. of Bids†	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
134	Wash & Core Borings in Counties of Middlesex, Norfolk & Suffolk	Sprague & Henwood	2	8/9/45	$8,492.25	$8,275.17	1/24/46
138	Soundings—Sludge Disposal Line Nut Island to President Roads	Greenland Drilling Co.	1	11/28/45	$14,717.50	$15,488.95	3/11/46

†The above contracts were all awarded to the lowest bidder.

STATUS OF CONTRACTS IN FORCE ON JUNE 30, 1946

Contract No.	Description	Contractor	No. of Bids†	Contract Executed	Basis of Award	Payments To Date
33	Purchase of Power at Shaft 1	New England Power Co.	Date of Agreement	8/6/31	Agreed rates	$13,437.55
42	Use of Worcester Sewerage System and Treatment Works a/c Rutland-Holden Sewer	City of Worcester	Date of Agreement	5/1/33	Lump Sum $325,000 Annual Charges *	$325,000.00 $5,200.45
46	Connections with Rutland-Holden Sewer & Disposal of Sewage from U. S. Veterans Hospital	U. S. Veterans Adm. (Note: Payments under Cont. 46 are Received by M.D.W.S.C.)	Date of Agreement	11/7/34	Lump Sum $37,000 Annual Charges *	$37,000.00 $6,110.60
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanitorium	Rutland State San. (Note: Payments under Cont. 48 are Received by M.D.W.S.C.)		6/5/34	Lump Sum $60,000 Annual Charges *	$60,000.00 $213.39
136	Fill at Nut Island	V. Barletta Co.	8	10/18/45	$478,814.36	$389,383.40
141 A & B	Engines, Generators, Blowers and Pumps at Nut Island	Worthington Pump & Machinry Company	5	5/31/46	$330,374.00	
142 A to H	Grit and Sludge Removal Equipment and Screens	Jeffrey Mfg. Co.	13	3/26/46	$137,927.00	
142 I	Comminutors	Chicago Pump Co.	1	3/19/46	$40,244.00	
147	Bituminous surface, Sea & Island Ave., Quincy	V. Barletta Co.	2	6/27/46	$15,288.81	
148	Sale of Power at Winsor Dam	Nw England Power Co. (Note: Net Payments under Cont. 148 are Received by M.D.W.S.C.)		5/1/45	Agreed Rates	None
149 A	Hydraulic Turbine Outlet Works, Belchertown	S. Morgan Smith Co.	2	6/25/45	$27,953.00	
149 B	Generator	Electric Machinery Mfg. Co.	3	7/16/45	$17,192.00	
149 C, E, F	Substation, Switchgear and Storage Battery	General Electric Co.	2	6/5/45	$15,008.00	
149 D	Transformer	Erie Electric Co.	3	6/5/45	$4,299.00	
150	Installing Power Plant at Winsor Dam	Berke-Moore Co., Inc.	2	3/27/46	$39,198.10	

* Proportion of Annual Maintenance Cost.

† The above contracts were all awarded to the lowest bidder.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR, AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION ON ACCOUNT OF METROPOLITAN WATER SUPPLY CONSTRUCTION FUND

General Overhead

Administration, *Commissioners' Office*:	Year Ending June 30, 1946	Total to June 30, 1946
Total Except the Following Listed Items	$0.00	$16,092.84
Salaries, Commissioners	5,631.24	203,961.54
Salaries, Clerical	19,896.92	275,165.90
Rent and Upkeep	2,508.13	45,855.65
Automobile Maintenance	320.74	6,348.01
Miscellaneous Expense (undistributed)	1,994.68	29,448.85
Printing and Blueprinting	110.60	15,008.70
Stationery and Office Supplies	163.63	5,523.12
Advertising	158.25	15,237.42
Postage	152.00	3,672.13
Currently Distributed Overhead	0.00	15,953.54
Total Administration, Commissioners' Office	$30,936.19	$632,267.70
Engineering, *Headquarters Office*:		
Total Except the Following Listed Items	$0.00	$72,414.21
Salaries, Engineering	22,936.42	1,279,975.09
Salaries, Clerical	11,703.43	253,702.72
Salaries, Engineering, Pension	1,470.00	7,962.50
General Consultant Expense	120.57	123,486.84
Furniture and Fixtures	2.06	16,031.52
Rent and Upkeep	6,291.33	189,100.52
Automobile Maintenance	339.74	7,029.62
Miscellaneous Expense (undistributed)	401.02	27,816.97
Printing and Blueprinting	182.47	20,417.11
Stationery and Office Supplies	325.08	9,892.89
Postage	181.05	4,893.58
Currently Distributed Overhead	0.00	261,166.97
Total Engineering, Headquarters Office	$43,953.17	$2,273,890.54
Total General Overhead	$74,889.36	$2,906,158.24

Distribution of General Overhead

Administration, *Commissioners' Office*:		
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$5,630.38	$130,455.77
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	0.00	129.21
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	24.75	31,536.46
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	0.00	173.20
Quabbin Reservoir (PWA)	0.00	1,589.11
Quabbin Reservoir (except PWA)	16,798.35	294,041.89
Winsor Dam (except PWA)	3,622.63	79,674.18
Winsor Dam (PWA)	0.00	193.84
Quabbin Dike	160.87	30,357.31
Special Investigations	0.00	4,298.45
Southern Sudbury Emergency Supply	0.00	8,690.28
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	349.58	16,048.72
Weston Aqueduct Siphons (PWA)	0.00	423.11
Hultman Aqueduct (Supply Section) (PWA)	0.00	6,771.17
Hultman Aqueduct (Supply Section) (except PWA)	1,014.71	5,696.68
Hultman Aqueduct (Distribution Section) (PWA)	0.00	5,976.56
Hultman Aqueduct (Distribution Section) (except PWA)	3,334.92	15,611.42
Spot Pond By-Pass (PWA)	0.00	430.30
Enlargement of Fells Reservoir (PWA)	0.00	170.04
Total Administration, Commissioners' Office	$30,936.19	$632,267.70

ENGINEERING, *Headquarters Office*:	Year Ending June 30, 1946	Total to June 30, 1946
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$7,999.48	$439,880.48
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	0.00	1,622.20
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	35.16	118,186.93
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	0.00	292.03
Quabbin Reservoir (PWA)	0.00	16,854.90
Quabbin Reservoir (except PWA)	23,866.57	969,614.81
Winsor Dam (except PWA)	5,146.92	236,470.69
Winsor Dam (PWA)	0.00	6,333.58
Quabbin Dike	228.56	111,584.71
Special Investigations	0.00	19,863.79
Southern Sudbury Emergency Supply	0.00	33,407.97
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	496.67	43,778.75
Wachusett Watershed Protection (PWA)	0.00	450.95
Weston Aqueduct Siphons (PWA)	0.00	5,722.73
Hultman Aqueduct (Supply Section) (PWA)	0.00	114,472.88
Hultman Aqueduct (Supply Section) (except PWA)	1,441.66	16,139.78
Hultman Aqueduct (Distribution Section) (PWA)	0.00	72,793.01
Hultman Aqueduct (Distribution Section) (except PWA)	4,738.15	45,909.75
Spot Pond By-Pass (PWA)	0.00	13,611.66
Enlargement of Fells Reservoir (PWA)	0.00	6,898.94
Total Engineering, Headquarters Office	$43,953.17	$2,273,890.54

WARE SUPPLY (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$5,630.38	$130,455.77
Engineering, Headquarters Office	7,999.48	439,880.48
TOTAL GENERAL OVERHEAD	$13,629.86	$570,336.25
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$41,344.64
Salaries, Engineering and Clerical	513.30	434,153.60
Consultant Expense	515.67	11,459.95
Labor	555.55	9,856.91
Miscellaneous Expense (undistributed)	10.09	11,672.07
Printing and Blueprinting	7.11	1,339.76
Stationery and Office Supplies	1.18	3,332.87
Postage	1.00	526.61
Automobile Maintenance	42.73	19,836.04
Rent and Upkeep	5.00	24,006.34
Tools and Equipment	3.82	671.74
Total Engineering	$1,655.45	$558,200.53
REAL ESTATE—GENERAL CONSTRUCTION:		
Total Except Special Agents	$0.00	$155,484.33
Special Agents, Salaries, Engineering	619.50	17,601.49
Total Real Estate	$619.50	$173,085.82
WARE WATERSHED:		
Total Except the Following Listed Items	$0.00	$335,766.84
Salaries, Engineering and Clerical	4,287.81	201,495.34
Legal and Expert Expense	1,028.70	42,898.41
Consultant Expense	236.10	1,228.01
Labor	3,731.25	89,844.24
Automobile Maintenance	246.78	15,410.48
Miscellaneous Expense (undistributed)	7.39	8,766.94
Printing and Blueprinting	23.72	1,179.15
Stationery and Office Supplies	3.52	968.51
Postage	5.00	209.82
Maintenance of Real Estate	1,322.55	14,231.99
Engineering Instruments	11.02	463.19
Medical and Surgical Services	9.00	204.66
Rent and Upkeep	4.17	1,421.65
Purchases and Settlements (including Certificate of Judgment)	9,828.09	1,698,908.28
Taxes	19,159.37	153,664.90
Total Ware Watershed	$39,904.47	$2,566,662.41

	Year Ending June 30, 1946	Total to June 30, 1946
WARE DIVERSION DAMAGES:	$0.00	$1,429,557.92
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:	$0.00	$9,643,641.87
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Total except Labor and Materials of Construction	0.00	187,117.51
Labor	122.50	10,284.29
Materials of Construction	324.42	1,073.73
Sub Ttotal Except Construction Contracts	$446.92	$198,475.53
Total Permanent Construction	$446.92	$9,842,117.40
Total Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$56,256.20	$15,139,960.33
WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQEDUCT (PWA ONLY)	$0.00	$107,531.91
TOTAL WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT	$56,256.20	$15,247,492.24

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (EXCEPT PWA)

	Year Ending June 30, 1946	Total to June 30, 1946
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$24.75	$31,536.46
Engineering, Headquarters Office	35.16	118,186.93
Total General Overhead	$59.91	$149,723.39
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$353,946.06
Installed Equipment	8.59	324.00
Labor	184.80	5,318.00
Total Engineering	$193.39	$359,588.06
REAL ESTATE—GENERAL CONSTRUCTION:	$0.00	$27,876.13
COLDBROOK-SWIFT DAMAGES:	$0.00	$8,668.18
PERMANENT CONSTRUCTION:	$0.00	$4,874,523.66
Total Coldbrook-Swift Tunnel Section (Except PWA)	$253.30	$5,420,379.42
COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)	$0.00	$2,305.44
TOTAL COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT	$253.30	$5,422,684.86
QUABBIN RESERVOIR (PWA ONLY)	$0.00	$2,086,051.39

QUABBIN RESERVOIR NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)

	Year Ending June 30, 1946	Total to June 30, 1946
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$16,798.35	$294,041.89
Engineering, Headquarters Office	23,866.57	969,614.81
Total General Overhead	$40,664.92	$1,263,656.70
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$95,889.89
Salaries, Engineering and Clerical	17,839.18	787,452.30
Consultant Expense	1,547.00	13,557.14
Labor	11,690.28	134,900.77
Tools and Equipment	31.98	3,510.41
Rent and Upkeep	47.66	45,713.67
Medical and Surgical Services	53.00	407.00
Automobile Maintenance	1,206.60	62,635.34
Miscellaneous Expense (unditributed)	2,561.13	24,728.76
Printing and Blueprinting	67.19	4,147.31
Stationery and Office Supplies	17.98	10,549.26
Postage	41.05	2,958.39
Labor on Automobiles and Mechanical Equipment	1,194.76	4,971.47
Maintenance of Mechanical Equipment	27.68	3,905.08
Maintenance of Grounds	32.00	4,677.65
Total Engineering	$36,357.49	$1,200,004.44

	Year Ending June 30, 1946	Total to June 30, 1946
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:		
Total Except the Following Listed Items	$0.00	$821,747.91
Legal and Expert Expense	433.08	193,612.43
Labor	799.07	32,705.77
Miscellaneous Expense (undistributed)	1,113.14	11,970.46
Printing and Blueprinting	3.67	1,835.62
Maintenance of Real Estate	110.93	18,542.54
Purchases and Settlements	2,417.00	7,321,978.77
Taxes	16,080.53	591,285.53
Labor on Automobiles and Mechanical Equipment	36.00	2,819.37
Fire Protection—Labor	33.00	78,937.24
Special Agents—Salaries	148.00	35,956.09
Sub Total Real Estate—Except Awards by Court Degree	$21,174.42	$9,111,391.73
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:	$0.00	$317,875.42
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Total Except the Following Listed Items	$0.00	$84,638.87
Legal Expenses	229.50	4,661.38
Payments under Certificates of Judgment	3,561.64	95,992.47
Sub Total Real Estate—Jury Verdicts	$3,791.14	$185,292.72
Total Real Estate	$24,965.56	$9,614,559.87
QUABBIN RESERVOIR DAMAGES:	$0.00	$82,779.78
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE AND PAYMENTS TO COUNTIES:		
Total Except the Following Listed Items	$0.00	$1,353,244.68
Salaries, Engineering and Clerical	2,457.47	140,532.51
Labor	733.12	19,525.89
Automobile Maintenance	2.00	5,258.51
Medical and Surgical Services	28.00	62.50
Sub Total Swift Diversion Damages—Except Awards by Court Decree	$3,220.59	$1,518,624.09
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) AWARDS BY COURT DECREE—JURY VERDICTS:		
Total Except Legal Expense	$0.00	$325,267.70
Legal Expense	14,865.58	49,056.93
Sub Total Swift Diversion Damages—Awards by Court Decree—Jury Verdicts	$14,865.58	$374,324.63
SWIFT DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR REIMBURSEMENT AND EXPENSES OF LITIGATION IN COUNTY COURTS:	$0.00	$4,307.05
Total Swift Diversion Damages (Including Beaver Brook)	$18,086.17	$1,897,255.77
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS: TOWN OBLIGATIONS:		
Town of Enfield	$566.40	$33,431.39
Town of Greenwich	716.85	14,071.18
Town of Prescott	24.19	5,886.28
Town of Dana	2,143.87	36,803.23
Sub Total Town Obligations	$3,451.31	$90,192.08
QUABBIN RESERVOIR—LIQUIDATION OF TOWNS: LIQUIDATING EXPENSES:	$1,249.20	$20,158.85
Total Quabbin Reservoir—Liquidation of Towns	$4,700.51	$110,350.93
QUABBIN RESERVOIR CEMETERIES (EXCEPT PWA):	$0.00	$265,762.32
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:	$0.00	$785,263.49
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTIONS FOR BREACH OF CONTRACT:	$0.00	$22,316.54
OTHER PERMANENT CONSTRUCTION—EXCEPT CLEARING	$0.00	$16,458.83
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT: Compensation Payments to Employees Injured on Work	$629.14	$47,158.25
All Other Items	0.00	1,794,652.10
Sub Total 1936 Clearing Project	$629.14	$1,841,810.35

	Year Ending June 30, 1946	Total to June 30, 1946
Other Permanent Construction—WPA Clearing Project:	$0.00	$3,387.76
Other Permanent Construction—Reservoir Clearing Not Including 1936 Clearing Project or WPA Clearing Project:		
Total Except the Following Listed Items	$0.00	$1,816.05
Salaries, Engineering	1,670.55	9,378.82
Labor	36,715.65	255,680.82
Compensation Payments to Employees Injured on Work	138.29	778.06
Tools and Equipment	92.47	880.86
Medical and Surgical Services	38.50	664.75
Sub Total Reservoir Clearing, Not Including 1936 Clearing Project or WPA	$38,655.46	$269,199.36
Total Quabbin Reservoir Permanent Construction	$39,284.60	$2,938,436.33
Highway and Public Utility Relocation:	$0.00	$1,389,807.47
Quabbin Reservoir Watershed—Reforestation Nurseries:		
Total Except the Following Listed Items	$0.00	$16,296.20
Salaries, Engineering and Clerical	131.70	9,096.58
Labor	290.10	110,622.55
Sub Total Reforestation—Nurseries	$421.80	$136,015.33
Quabbin Reservoir Watershed—Reforestation Waterhed Planting:		
Total Except the Following Listed Items	$0.00	$4,278.72
Salaries, Engineering and Clerical	393.40	7,454.54
Labor	691.65	102,179.41
Medical and Surgical Services	3.00	532.90
Sub Total Reforestation—Watershed Planting	$1,088.05	$114,445.57
Quabbin Reservoir Watershed—Reforestation: Fire Stops and Fire Access Roads:		
Labor	$1,996.41	$63,736.26
All Other Items	0.00	20,125.32
Sub Total Reforestation Fire Stops and Fire Access Roads	$1,996.41	$83,861.58
Quabbin Reservoir Watershed—Fencing of Watershed Property:		
Labor	$29.55	$4,358.90
All Other Items	0.00	2,176.28
Sub Total Fencing of Watershed Property	$29.55	$6,535.18
Quabbin Reservoir Watershed—Other Forestry and Hurricane Clearing:		
Labor	$240.00	$42,203.28
All Other Items	0.00	9,321.78
Sub Total Other Forestry and Hurricane Clearing	$240.00	$51,525.06
Quabbin Reservoir Watershed—Patrol Equipment:	$0.00	$6,773.99
Total Quabbin Reservoir Watershed	$3,775.81	$399,156.71
Total Quabbin Reservoir, not Including Winsor Dam and Quabbin Dike (Except PWA)	$167,835.06	$19,161,770.32
Total Quabbin Reservoir, Not Including Winsor Dam and Quabbin Dike	$167,835.06	$21,247,821.71

Winsor Dam (Except PWA)

	Year Ending June 30, 1946	Total to June 30, 1946
General Overhead:		
Administration, Commissioners' Office	$3,622.63	$79,674.18
Engineering, Headquarters Office	5,146.92	236,470.69
Total General Overhead	$8,769.55	$316,144.87
Engineering:		
Total Except the Following Listed Items	$0.00	$86,712.35
Salaries, Engineering and Clerical	570.17	388,335.11
Consultant Expense	10.57	6,879.07
Labor	521.60	68,984.63
Medical and Surgical Services	62.00	197.00
Miscellaneous Expense (undistributed)	8.56	13,940.32
Printing and Blueprinting	52.08	2,603.92
Total Engineering	$1,224.98	$567,652.40

	Year Ending June 30, 1946	Total to June 30, 1946
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$0.00	$2,416,131.40
Contract 52, Embankment, Winsor Dam	15,569.19	2,442,495.37
Contract 149, Group C, Switchgear and Appurtenances	2,777.40	2,777.40
Contract 149, Group D, Transformer	3,095.28	3,095.28
Contract 150, Installation of above and Construction of Power Line at and Near Winsor Dam	4,757.40	4,757.40
Sub Total Construction Contracts	$26,199.27	$4,869,256.85
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:	$0.00	$74,711.05
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTION FOR BREACH OF CONTRACT:		
Legal Expense	$2.50	$25,299.72
All Other Items	0.00	33,171.78
Sub Total Permanent Construction—Awards	$2.50	$58,471.50
Total Permanent Construction	$26,201.77	$5,002,439.40
Total Winsor Dam (Except PWA)	$36,196.30	$5,886,236.67

WINSOR DAM (PWA ONLY)

	$0.00	$61,261.84
TOTAL WINSOR DAM	$36,196.30	$5,947,498.51

QUABBIN DIKE

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$160.87	$30,357.31
Engineering, Headquarters Office	228.56	111,584.71
Total General Overhead	$389.43	$141,942.02
ENGINEERING:		
Labor	$228.90	$42,653.54
All Other Items	0.00	221,350.06
Total Engineering	$228.90	$264,003.60
PERMANENT CONTRUCTION—CONSTRUCTION COKTRACTS:		
Completed Contracts	$0.00	$1,054,137.90
Contract No. 50, Embankment of Dike	1,000.00	$1,402,751.98
Sub Total Construction Contracts	$1,000.00	$2,456,889.88
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:	$0.00	$23,863.21
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—ACTION FOR BREACH OF CONTRACT:	$0.00	$18,911.94
Total Permanent Construction	$1,000.00	$2,499,665.03
TOTAL QUABBIN DIKE	$1,618.33	$2,905,610.65

SPECIAL INVESTIGATIONS

Total Expenditure	$0.00	$149,609.63

SOUTHERN SUDBURY EMERGENCY SUPPLY

Total Expenditure	$0.00	$638,533.83

WACHUSETT WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$349.58	$16,048.72
Engineering, Headquarters Office	496.67	43,778.75
Total General Overhead	$846.25	$59,827.47

	Year Ending June 30, 1946	Total to June 30, 1946
ENGINEERING—EXCEPT WPA PROJECTS:	$0.00	$36,037.30
REAL ESTATE:	$0.00	$19,330.57
TOWN OF HOLDEN SEWER (WPA SEWER):	$0.00	$153,741.94
TOWN OF RUTLAND SEWER (WPA PROJECT):		
Total Except the Following Listed Items	$0.00	$37,166.69
Salaries, Engineering and Clerical	378.25	40,320.77
Labor	66.00	32,630.77
Miscellaneous Expense (undistributed)	0.90	25,940.11
Total Town of Rutland Sewer (WPA Project)	$445.15	$136,058.34
WEST BOYLSTON SEWER:		
Total Except the Following Listed Items	$0.00	$439.37
Salaries, Engineering and Clerical	2,118.75	16,264.55
Labor	67.20	524.55
Rent and Upkeep	7.40	44.65
Automobile Maintenance	5.84	414.46
Total West Boylston Sewer	$2,199.19	$17,687.58
Total Wachusett Watershed Protection and Elimination of Pollution (Except PWA)	$3,490.59	$422,683.20

WACHUSETT WATERSHED PROTECTION (PWA ONLY)

	$0.00	$450.95
TOTAL WACHUSETT WATERSHED PROTECTION	$3,490.59	$423,134.15

WESTON AQUEDUCT SIPHONS (PWA)

Total Expenditure	$0.00	$336,169.80

HULTMAN AQUEDUCT SUPPLY SECTION (PWA)

Total Except Real Estate	$0.00	$9,859,049.18
REAL ESTATE:		
Total Except Taxes	$0.00	$224,472.29
Taxes	2,218.56	14,487.52
Total Real Estate	$2,218.56	$238,959.81
Total Hultman Aqueduct, Supply Section (PWA)	$2,218.56	$10,098,008.99

HULTMAN AQUEDUCT SUPPLY SECTION (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$1,014.71	$5,696.68
Engineering Headquarters Office	1,441.66	16,139.78
Total General Overhead	$2,456.37	$21,836.46
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$1,036.29
Salaries, Engineering and Clerical	4,640.83	46,636.18
Labor	739.44	846.32
Miscellaneous Expense (undistributed)	6.25	21.20
Printing and Blueprinting	28.13	49.88
Automobile Maintenance	17.40	161.69
Legal Expense	39.35	168.82
Total Engineering	$5,471.40	$48,920.38
PERMANENT CONSTRUCTION:	$0.00	$3,108.61
Total Hultman Aqueduct, Supply Section (Except PWA)	$7,927.77	$73,865.45
TOTAL HULTMAN AQUEDUCT, SUPPLY SECTION	$10,146.33	$10,171,874.44

Hultman Aqueduct, Distribution Section (PWA)

	Year Ending June 30, 1946	Total to June 30, 1946
Total Except Real Estate	$0.00	$2,768,410.82
Real Estate:		
Total Except Taxes	$0.00	$62,445.54
Taxes	1,169.42	6,888.55
Total Real Estate	$1,169.42	$69,334.09
Total Hultman Aqueduct, Distribution Section (PWA)	$1,169.42	$2,837,744.91

Hultman Aqueduct, Distribution Section (Except PWA)

	Year Ending June 30, 1946	Total to June 30, 1946
General Overhead:		
Administration, Commissioners' Office	$3,334.92	$15,611.42
Engineering, Headquarters Office	4,738.15	45,909.75
Total General Overhead	$8,073.07	$61,521.17
Engineering:		
Total Except the Following Listed Items	$0.00	$2,736.31
Salaries, Eingineering and Clerical	10,534.03	148,557.98
Legal Expense	2,587.72	5,267.11
Labor	1,960.53	3,062.80
Miscellaneous Expense (undistributed)	188.75	1,153.33
Printing and Blueprinting	33.37	412.56
Stationery and Office Supplies	58.14	501.17
Rent and Upkeep	143.81	1,082.31
Automobile Maintenance	258.85	2,276.94
Tools and Equipment	2.06	148.53
Contracts for Investigations and Surveys	8,275.17	30,338.18
Total Engineering	$24,042.43	$195,537.22
Permanent Constructions	$0.00	$3,901.73
Total Hultman Aqueduct, Distribution Section (except PWA)	$32,115.50	$260,960.12
TOTAL HULTMAN AQUEDUCT, DISTRIBUTION SECTION	$33,284.92	$3,098,705.03

Spot Pond By-Pass and Improvements to Pumping Station (PWA)

Total Expenditure	$0.00	$218,798.74

Enlarging Fells High-Level Distributing Reservoir (PWA)

Total Expenditure	$0.00	$175,444.61

Deferred Charges to Maintenance—1946 Deficiency

	$5,340.67	$5,340.67

SUMMARY

Water Supply Construction Fund

Total authorized under Chapters 111 and 375, Acts of 1926 and Chapter 321, Acts of 1927		$65,900,000.00	
Amount reverted from authorization under said Chapter 111		261,466.17	$65,638,533.83
Received from City of Worcester under said Chapter 375	$1,000,000.00		
Income Credited to Construction Fund	1,092,692.51		
Serial Bonds issued and matured	20,296,000.00*		
Serial Bonds outstanding June 30, 1946	38,454,000.00		
Balance of Authorization available for issue	4,795,841.32		
	$65,638,533.83		
Contributions by Federal Government From PWA Funds		$0.00	$7,073,003.78
Total Construction Fund			$72,711,537.61

*Not Including Maturities of July 1, 1946 amounting to $1,097,000.

EXPENDITURES

	Year Ending June 30, 1946	Total to June 30, 1946
SOUTHERN SUDBURY EMERGENCY SUPPLY	$0.00	$638,533.83
WARE AND SWIFT SUPPLY (INCLUDING PORTION UNDER PWA):		
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct	$56,256.20	$15,247,492.24
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct	253.30	5,422,684.86
Quabbin Reservoir	167,835.06	21,247,821.71
Winsor Dam	36,196.30	5,947,498.51
Quabbin Dike	1,618.33	2,905,610.65
SPECIAL INVESTIGATIONS	$0.00	$149,609.63
WACHUSETT WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (INCLUDING BOTH PWA AND WPA PROJECTS)	$3,490.59	$423,134.15
HULTMAN AQUEDUCT AND OTHER WORKS, INCLUDING PORTION UNDER PWA:		
Weston Aqueduct Siphons	$0.00	$336,169.80
Hultman Aqueduct, Supply Section	10,146.33	10,171,874.44
Hultman Aqueduct, Distribution Section	33,284.92	3,098,705.03
Spot Pond By-Pass and Improvements to Pumping Station	0.00	218,798.74
Enlarging Fells High-Level Distributing Reservoir	0.00	175,444.61
DEFERRED CHARGES TO MAINTENANCE—1946 DEFICIENCY	5,340.67	5,340.67
Total Expenditures	$314,421.70	$65,988,718.87

RECEIPTS

	Year Ending June 30, 1946	Total to June 30, 1946
Receipts from Sales	$14,126.63	$493,551.20
Receipts from Rents	1,472.00	472,490.20
All Other Receipts	45.00	154,310.02
Total Receipts, Construction Fund	$15,643.63	$1,120,351.42

DISTRIBUTION OF RECEIPTS

Credited to Annual Water Assessments as Follows:			
To 1928 Assessment, Rents and Sales	$3,033.03		
To 1929 Assessment, Rents and Sales	24,343.77		
To Assessments 1927 to Date, Interest	282.11	$0.00	$27,658.91
Credited to Construction Fund		15,643.63	1,092,692.51
Total Receipts, Construction Account		$15,643.63	1,120,351.42

FURTHER EXPENDITURES BY THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION TO BE ASSESSED ON CITIES AND TOWNS IN THE METROPOLITAN PARKS DISTRICT UNDER CHAPTER #59, RESOLVES OF 1945.

FOR NEPONSET RIVER INVESTIGATION

GENERAL OVERHEAD:	
Administration, Clerical salaries	$36.94
ENGINEERING:	
Salaries, engineering and clerical	1,616.96
Printing and Blueprinting	3.02
Stationery and Office Supplies	2.00
TOTAL NEPONSET RIVER INVESTIGATION	$1,658.92

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR BY THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

FROM MAINTENANCE FUNDS

General Overhead:	Total to June 30, 1946
Administration, Commissioner's Office—Clerical Salaries	$3,353.12
Engineering, Headquarters Office—Clerical Salaries	1,226.30
Total General Overhead	$4,579.42

Ware Supply and Quabbin Aqueduct

Maintenance and Operation of Water Supply Works:	
Salaries, Engineering and Clerical	$7,375.40
Labor	9,698.09
Supplies	597.00
Automobile Maintenance	1,007.03
Installed Equipment	1,156.04
Tools and Other Mechanical Equipment	186.03
Rent and Upkeep	2,646.77
Miscellaneous Expense (undistributed)	42.79
Stationery and Office Supplies	42.57
Postage	14.64
Medical and Surgical Services	89.90
Compensation to Labor for Injuries	57.14
Sub Total Maintenance and Operation of Water Supply Works	$22,913.40
Maintenance of Watershed:	
Salaries, Engineering	$6,101.05
Labor	9,357.09
Supplies	15.76
Automobile Maintenance	1,161.13
Tools and Other Mechanical Equipment	31.05
Rent and Upkeep	203.17
Miscellaneous Expense (undistributed)	34.99
Stationery and Office Supplies	30.93
Printing and Blueprinting	1.76
Postage	11.85
Medical and Surgical Services	30.00
Medical and Surgical Supplies	7.65
Compensation to Labor for Injuries	57.18
Sub Total Maintenance of Watershed	$17,043.61
Guarding and Fire Protection:	
Police Protection—Labor	$930.90
Fire Protection—Labor	674.99
Supplies	2.26
Automobile Maintenance	7.01
Miscellaneous Expense (undistributed)	8.90
Sub Total Guarding and Fire Protection	$1,624.06
Maintenance and Operation of Rutland-Holden Sewer:	
Salaries, Engineering	$424.00
Labor	894.58
Supplies	4.00
Use of City of Worcester Sewerage System	749.63
Sub Total Maintenance of Rutland-Holden Sewer	$2,072.21
Total Ware Supply and Quabbin Aqueduct	$43,653.28

Quabbin Reservoir

Maintenance and Operation of Water Supply Works:	
Salaries, Engineering and Clerical	$17,023.98
Labor	17,757.70
Supplies	1,184.42
Automobile Maintenance	1,809.97
Installed Equipment	55.03
Tools and Other Mechanical Equipment	479.97
Rent and Upkeep	6,289.65
Miscellaneous Expense (undistributed)	324.17
Printing and Blueprinting	102.65
Stationery and Office Supplies	74.57
Postage	21.11
Medical and Surgical Services	10.00
Sub Total Maintenance and Operation of Water Supply Works	$45,133.22

	Total to June 30, 1946
Maintenance of Reservoir and Watershed:	
Salaries, Engineering and Clerical	$2,869.35
Labor	14,501.88
Supplies	839.69
Automobile Maintenance	1,787.98
Boats and Other Floating Equipment	241.81
Tools and Other Mechanical Equipment	1,533.53
Rent and Upkeep	41.75
Miscellaneous Expense (undistributed)	12.61
Stationery and Office Supplies	23.71
Postage	24.03
Medical and Surgical Services	37.00
Medical and Surgical Supplies	2.45
Compensation to Labor for Injuries	112.50
Sub Total Maintenance of Reservoir and Watershed	$22,028.29
Guarding and Fire Protection:	
Police Protection:	
Labor	$312.03
Automobile Maintenance	—578.68
Fire Protection:	
Salaries, Engineering	$733.70
Labor	7,744.28
Fire Equipment	375.41
Automobile Maintenance	11.65
Supplies	1,836.60
Rent and Upkeep	27.93
Sub Total Guarding and Fire Protection	$10,462.92
Maintenance and Operation of Quabbin Park Cemetery:	
Salaries, Engineering and Clerical	$2,445.25
Labor	8,772.28
Supplies	444.06
Automobile Maintenance	35.06
Tools and Other Mechanical Equipment	180.27
Rent and Upkeep	37.20
Miscellaneous Expense (undistributed)	0.30
Postage	3.48
Sub Total Maintenance of Quabbin Park Cemetery	$11,917.90
Total Maintenance of Quabbin Reservoir	$89,542.33

Hultman Aqueduct—Supply Section

Salaries, Engineering and Clerical	$6,895.51
Labor	3,623.10
Automobile Maintenance	855.04
Installed Equipment	2.80
Tools and Other Mechanical Equipment	39.35
Rent and Upkeep	365.61
Miscellaneous Expense (undistributed)	55.49
Stationery and Office Supplies	21.83
Postage	5.00
Total Maintenance of Hultman Aqueduct ,Supply Section	$11,863.73

Hultman Aqueduct—Distribution Section

Salaries, Engineering and Clerical	$16,060.52
Labor	11,265.45
Supplies	108.27
Automobile Maintenance	1,050.69
Tools and Other Mechanical Equipment	156.60
Rent and Upkeep	2,457.88
Miscellaneous Expense (undistributed)	217.96
Printing and Blueprinting	17.49
Stationery and Office Supplies	102.04
Postage	26.10
Medical and Surgical Services	643.25
Compensation to Labor for Injuries	785.73
Total Maintenance of Hultman Aqueduct, Distribution Section	$32,891.98

SUMMARY

WATER SUPPLY MAINTENANCE FUNDS

EXPENDITURES

	Total to June 30, 1946
General Overhead	$4,579.42
Ware Supply and Quabbin Aqueduct	43,653.28
Quabbin Reservoir	89,542.33
Hultman Aqueduct, Supply Section	11,863.73
Hultman Aqeduct, Distribution Section	32,891.98
Total Expenditures	$182,530.74

RECEIPTS

Receipts from Rents	$1,258.00
Quabbin Park Cemetery:	
Receipts from Sale of Lots	166.25
Interment Fees, etc.	668.35
Miscellaneous (reimbursements for Sewage Disposal)	2,366.51
Total Cash Receipts	$4,459.11

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

AS ENLARGED BY CHAPTER 705 OF THE ACTS OF 1945

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND TOTAL TO DATE ON ACCOUNT OF METROPOLITAN SEWAGE DISPOSAL

SEWAGE DISPOSAL FUND

Total Appropriated under Chapter 512, Acts of 1939, Chapter 720, Acts of 1941, Chapter 705, Acts of 1945 and Chapter 446, Acts of 1946, from Total of $15,000,000.00 authorized		$6,289,907.23
Serial Bonds issued and matured	$36,000.00	
Serial Bonds outstanding June 30, 1946	1,564,000.00	
Balance of Appropriation available for Issue	4,506,167.96	
	$6,106,167.96	

Expenditures by Metropolitan District Commission (1940-1941)

Contract for Borings	$36,291.61	
Preliminary Report of Consulting Engineers	147,303.81	
Miscellaneous	143.85	183,739.27
New Sewage Disposal Fund Available		$6,106,167.96

EXPENDITURES

Nut Island Sewage Treatment Plant

	Year Ending June 30, 1946	Total to June 30, 1946
General Overhead:		
Administration, Commissioners' Office	$14,836.66	$14,909.06
Engineering, Headquarters Office	114,783.77	218,282.27
Total General Overhead	$129,620.43	$233,191.33
Engineering (Field):		
Salaries, Engineering and Clerical	$70,319.14	$110,665.09
Consultant Expense	242.52	421.96
Legal Expense	800.00	1,355.40
Labor	4,775.21	7,431.05
Engineering Instruments	426.89	439.13
Tools and Equipment	14.07	127.68
Laboratory Equipment	733.69	1,146.69
Furniture and Fixtures	98.71	98.71
Rent and Upkeep	398.35	564.15
Automobile Maintenance	1,643.96	2,574.22
Maintenance of Mechanical Equipment	0.00	70.83
Rental of Equipment	150.00	150.00
Miscellaneous Expense (undistributed)	884.08	1,264.48
Printing and Blueprinting	538.68	697.66
Stationery and Office Supplies	264.70	296.97
Postage	49.58	60.68
Laboratory Supplies	203.67	415.55
Medical and Surgical Services	23.50	223.82
Medical and Surgical Supplies	42.46	42.46
Compensation to Labor for Injuries	19.94	71.36
Total Engineering	$81,629.15	$128,117.89
Real Estate:		
Legal Expense	$702.55	$702.55

PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Contract No. 136, Earthwork Excavation and Fill at and near Nut Island, Quincy	$276,081.08	$276,081.08
Contract No. 138, Soundings for Location of Sludge Disposal Line Nut Island, Quincy	15,488.95	15,488.95
Total Permanent Construction	$291,570.03	$291,570.03
TOTAL NUT ISLAND SEWAGE TREATMENT PLANT	$503,522.16	$653,581.80

CHARLES RIVER BASIN, STORM OVERFLOW SEWER, SOUTH SIDE

GENERL OVERHEAD:		
Engineering, Headquarters Office	$1,090.10	$3,962.68
ENGINEERING (Field):		
Salaries, Engineering and Clerical	$661.52	$1,537.23
TOTAL CHARLES RIVER BASIN, STORM OVERFLOW SEWER, SOUTH SIDE	$1,751.62	$5,499.91

CHARLES RIVER BASIN, STORM OVERFLOW SEWER, NORTH SIDE

GENERL OVERHEAD:		
Engineering, Headquarters Office	$383.18	$2,150.91
ENGINEERING (Field):		
Salaries, Engineering and Clerical	$770.40	$1,362.70
TOTAL CHARLES RIVER BASIN, STORM OVERFLOW, NORTH SIDE	$1,153.58	$3,513.61

ALEWIFE BROOK STORM OVERFLOW SEWER

GENERL OVERHEAD:		
Engineering, Headquarters Office	$1,593.32	$1,593.32
ENGINEERING (Field):		
Salaries, Engineering	$3,223.02	$3,223.02
Labor	210.60	210.60
Automobile Maintenance	26.93	26.93
Total Engineering	$3,460.55	$3,460.55
TOTAL ALEWIFE BROOK STORM OVERFLOW SEWER	$5,053.87	$5,053.87

SUMMARY

NUT ISLAND SEWAGE TREATMENT PLANT	$503,522.16	$653,581.80
CHARLES RIVER BASIN, STORM OVERFLOW SEWER, SOUTH SIDE	$1,751.62	$5,499.91
CHARLES RIVER BASIN, STORM OVERFLOW SEWER, NORTH SIDE	$1,153.58	$3,513.61
ALEWIFE BROOK STORM OVERFLOW SEWER	$5,053.87	$5,053.87
Total Expenditures	$511,481.23	$667,649.19

The principal financial items of this report are in agreement with the Comptroller's Books.

Date: January 16, 1947.

Checked by: JOSEPH A. PRENNEY.

FRED A MONCEWICZ,
Comptroller.

CANVASS OF BIDS FOR CONTRACT 133 — OPENED MAY 1, 1946

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
(AS ENLARGED)

CONTRACT 133

FOR CONSTRUCTING AN INVERTED PIPE SIPHON ON THE WACHUSETT AQUEDUCT AT THE ASSABET RIVER IN THE TOWN OF NORTHBOROUGH, MASSACHUSETTS.

				① A.D. Daddario 58 Chauncy St. Boston Mass.		② Berke-Moore Co. Inc. 11 Boylston St Brookline Mass. ★		③ George M. Byrne 294 Washington St Boston Mass.		④ Marson Cons. Co. Inc 38 Kent St Somerville Mass.		⑤ Coleman Bros. Corp 40 Central St Boston Mass.		⑥ William Casey & Sons Inc. 52 Prospect Drive Yonkers N.Y.	
UNIT NO	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Earth Excavation	Cu.Yd.	10,000	2.00	20,000.00	3.00	30,000.00	3.00	30,000.00	3.00	30,000.00	3.00	30,000.00	7.57	75,700.00
2	Rock Excavation	Cu.Yd.	500	2.00	1,000.00	10.00	5,000.00	8.00	4,000.00	13.00	6,500.00	6.00	3,000.00	15.40	7,700.00
3	Refill and Embankment	Cu.Yd	6,000	1.00	6,000.00	.50	3,000.00	1.50	9,000.00	3.00	18,000.00	1.00	6,000.00	2.24	13,440.00
4	Compacted Refill and Embankment	Cu.Yd.	1,500	2.00	3,000.00	2.00	3,000.00	2.00	3,000.00	5.00	7,500.00	1.50	2,250.00	3.22	4,830.00
5	Soil Dressing and Grassing	Cu.Yd.	500	4.00	2,000.00	3.00	1,500.00	4.00	2,000.00	8.00	4,000.00	3.00	1,500.00	6.43	3,215.00
6	Crushed Stone or Screened Gravel	Cu.Yd.	500	4.00	2,000.00	3.00	1,500.00	4.00	2,000.00	4.00	2,000.00	4.00	2,000.00	5.78	2,890.00
7	Paving	Cu.Yd.	60	10.00	600.00	10.00	600.00	12.00	720.00	10.00	600.00	10.00	600.00	22.50	1,350.00
8	Steel-plate Pipe with Mortar Lining	Lin.Ft.	400	165.00	66,000.00	130.00	52,000.00	137.50	55,000.00	200.00	80,000.00	175.00	70,000.00	153.00	61,200.00
9	Interior Forms for Concrete Conduit	Lin.Ft.	150	30.00	4,500.00	20.00	3,000.00	50.00	7,500.00	40.00	6,000.00	20.00	3,000.00	58.60	8,790.00
10	Concrete Envelope in Siphon	Cu.Yd.	1,500	15.00	22,500.00	20.00	30,000.00	30.00	45,000.00	15.00	22,500.00	30.00	45,000.00	15.42	23,130.00
11	Concrete (except Items 8 and 10)	Cu.Yd	30	15.00	450.00	40.00	1,200.00	30.00	900.00	15.00	450.00	30.00	900.00	45.00	1,350.00
12	Reinforcing Steel	Lb.	25,000	.10	2,500.00	.08	2,000.00	.10	2,500.00	.10	2,500.00	.10	2,500.00	.13	3,250.00
13	Portland Cement	Bbl.	2,500	3.00	7500.00	3.50	8,750.00	3.25	8,125.00	2.80	7,000.00	3.00	7,500.00	3.44	8,600.00
14	Miscellaneous Steel and Iron	Lb.	10,000	.20	2000.00	.10	1,000.00	.20	2,000.00	.20	2,000.00	.20	2,000.00	.19	1,800.00
15	Galvanizing	Lb.	1,000	.10	100.00	.25	250.00	.05	50.00	.10	100.00	.50	500.00	.32	320.00
16	Caring for and setting Metal Work furnished by the Commission.	Lb.	2,000	.20	400.00	.05	100.00	.20	400.00	.20	400.00	.15	300.00	.13	260.00
17	Road Surfacing	Sq.Yd.	80	3.00	240.00	5.00	400.00	4.00	320.00	3.00	240.00	4.00	320.00	4.50	360.00
18	Wooden Sheeting ordered left in place	M.Ft. B.M.	10	150.00	1500.00	150.00	1500.00	100.00	1000.00	100.00	1000.00	150.00	1,500.00	38.60	386.00
19	Assabet River Crossing	Lump S.		11,000.00	11,000.00	25,000.00	25,000.00	15,000.00	15,000.00	25,000.00	25,000.00	45,000.00	45,000.00	44,227.00	44,227.00
20	Connections to Wachusett Aqueduct	Lump S.		4,000.00	4,000.00	25,000.00	25,000.00	15,000.00	15,000.00	18,000.00	18,000.00	37,500.00	37,500.00	32,377.00	32,377.00
21	Cleaning Up	Lump S.		1,500.00	1,500.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	2,570.00	2,570.00
	Sub-Totals (Items 1 to 21 incl.)				158,790.00		195,800.00		204,515.00		234,790.00		262,370.00		297,845.00
22	Furnishing Performance Bond, Rate per $1,000	Not over $15.00		10.00	1,587.90	10.00	1,958.00	10.00	2,045.15	12.50	2,934.88	10.00	2,623.70	15.00	4,467.67
	Totals				$160,377.90		$197,758.00		$206,560.15		$237,724.88		$264,993.70		$302,312.67
	Bid Security B.B. INDICATES BID BOND C.C. INDICATES CERTIFIED CHECK				B.B. $10,000.00		C.C. $10,000.00		BB. $12,000.00		BB. $17,500.00		BB. $15,000.00		C.C. $15,000.00

★ Contract awarded June 25, 1946
Contract executed August 28, 1946

Tabulated by C.R.B. & J.F.C.
Traced by E.H.P.
Checked by E.G.H.

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CANVASS OF BIDS FOR CONTRACT 136 — OPENED SEPT. 27, 1945.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
(AS ENLARGED)

CONTRACT 136

FOR EARTHWORK—EXCAVATION AND FILL AT AND NEAR NUT ISLAND IN THE CITY OF QUINCY, MASSACHUSETTS

				① V. Barletta Co. 10 Whipple Ave. Roslindale, Mass. ★		② Henry N. Worthington and Co., 159 Newport Ave., Quincy, Mass.		③ M. DeMatteo Construction Co., 200 Hancock St., Quincy, Mass.		④ Marinucci Bros. and Co. 51 Ceylon St., Dorchester, Mass.		⑤ C and R Construction Co., Incorporated, 75 Bradeen St., Roslindale, Mass.		⑥ Coleman Bros. Corp. 245 State St., Boston, Mass. and Bay State Dredging & Construction Co., 62 Condon St., East Boston, Mass.		⑦ Dooley Bros., Inc., 39 George St., Roxbury, Mass.		⑧ B. Perini & Sons, Incorporated, Framingham, Mass.	
ITEM NO.	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Stripping and Storage of Topsoil	Cu. Yd.	2,000	1.00	2,000.00	0.50	1,000.00	0.30	600.00	1.00	2,000.00	0.75	1,500.00	1.00	2,000.00	3.00	6,000.00	1.05	2,100.00
2	Removing Existing Stonework Protection	Cu. Yd.	10,000	1.00	10,000.00	2.00	20,000.00	2.00	20,000.00	3.00	30,000.00	2.20	22,000.00	4.00	40,000.00	3.00	30,000.00	2.35	23,500.00
3	Excavation, Class A	Cu. Yd.	35,000	1.00	35,000.00	0.60	21,000.00	0.42	14,700.00	0.70	24,500.00	0.80	28,000.00	1.00	35,000.00	0.80	28,000.00	1.70	59,500.00
4	Excavation, Class B	Cu. Yd.	30,000	0.30	9,000.00	1.00	30,000.00	0.18	5,400.00	0.50	15,000.00	0.90	27,000.00	0.25	7,500.00	0.20	6,000.00	1.10	33,000.00
5	Embankment, Class A	Cu. Yd.	30,000	1.10	33,000.00	0.60	18,000.00	0.32	9,600.00	0.60	18,000.00	0.45	13,500.00	0.50	15,000.00	0.60	18,000.00	1.60	48,000.00
6	Embankment, Class B	Cu. Yd.	250,000	1.10	275,000.00	1.00	250,000.00	1.05	262,500.00	1.27	317,500.00	1.34	335,000.00	1.55	387,500.00	1.00	250,000.00	2.05	512,500.00
7	Crushed Stone and Screened Gravel	Cu. Yd.	5,000	2.50	12,500.00	3.25	16,250.00	2.95	14,750.00	3.00	15,000.00	2.90	14,500.00	3.50	17,500.00	5.00	25,000.00	6.00	30,000.00
8	Sand or Gravel	Cu. Yd.	16,000	1.10	17,600.00	1.50	24,000.00	1.75	28,000.00	1.50	24,000.00	2.75	44,000.00	2.25	36,000.00	2.50	40,000.00	3.40	54,400.00
9	Riprap	Cu. Yd.	12,000	3.00	36,000.00	3.50	42,000.00	6.00	72,000.00	4.00	48,000.00	3.45	41,400.00	2.00	24,000.00	4.50	54,000.00	6.50	78,000.00
10	Rough Paving	Cu. Yd.	4,500	3.00	13,500.00	8.00	36,000.00	8.00	36,000.00	6.00	27,000.00	8.00	36,000.00	7.50	33,750.00	7.00	31,500.00	18.00	81,000.00
11	Concrete	Cu. Yd.	40	35.00	1,400.00	25.00	1,000.00	40.00	1,600.00	8.00	320.00	50.00	2,000.00	50.00	2,000.00	50.00	2,000.00	55.00	2,200.00
12	Portland Cement	Bbl.	100	3.50	350.00	4.00	400.00	18.00	1,800.00	3.50	350.00	3.50	350.00	4.00	400.00	4.00	400.00	5.00	500.00
13	Reinforcing Steel	Pound	2,000	0.10	200.00	0.10	200.00	0.15	300.00	0.15	300.00	0.15	300.00	0.10	200.00	0.15	300.00	0.10	200.00
14	Miscellaneous Steel and Iron	Pound	30,000	0.12	3,600.00	0.10	3,000.00	0.09	2,700.00	0.12	3,600.00	0.10	3,000.00	0.20	6,000.00	*14.00	420,000.00	0.07	2,100.00
15	Precast Reinforced-Concrete Pipe	Lin. Ft.	200	30.00	6,000.00	15.00	3,000.00	22.00	4,400.00	18.00	3,600.00	40.00	8,000.00	25.00	5,000.00	20.00	4,000.00	25.00	5,000.00
16	Tile Pipe, 12-Inch and Under	Lin. Ft.	200	5.00	1,000.00	2.50	500.00	1.25	250.00	1.00	200.00	1.50	300.00	4.00	800.00	2.00	400.00	2.20	440.00
17	Tile Pipe, Over 12-Inch	Lin. Ft.	100	6.00	600.00	3.50	350.00	2.50	250.00	2.50	250.00	2.00	200.00	6.00	600.00	4.00	400.00	3.25	325.00
18	Miscellaneous Timber and Lumber	M.B.M.	5	200.00	1,000.00	300.00	1,500.00	250.00	1,250.00	300.00	1,500.00	260.00	1,300.00	300.00	1,500.00	300.00	1,500.00	425.00	2,125.00
19	Stonework on Drain Outlet, Disposal of Pier, Removal of Boathouse and Relocation of Pipe Lines	Lump S.		15,000.00	15,000.00	12,000.00	12,000.00	17,300.00	17,300.00	5,000.00	5,000.00	11,000.00	11,000.00	26,500.00	26,500.00	6,000.00	6,000.00	29,000.00	29,000.00
20	Cleaning Up	Lump S.		2,500.00	2,500.00	1,000.00	1,000.00	400.00	400.00	1,500.00	1500.00	2,500.00	2,500.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
	Sub-Totals (Items 1 to 20 incl.)				475,250.00		481,200.00		493,800.00		537,620.00		591,850.00		642,250.00		924,500.00		964,890.00
21	Furnishing Performance Bond, Rate per $1,000			7.50	3,564.38	ϕ1.15	553.38	10.00	4,938.00		8,064.30	10.00	5918.50	11.00	7,064.75	#15.00	13,867.50	15.00	14,473.35
	Totals				$478,814.38		$481,753.38		$498,738.00		$545,684.30		$597,768.50		$649,314.75		* $938,367.50		$979,363.35
	Bid Security B.B. INDICATES BID BOND C.C. INDICATES CERTIFIED CHECK			C.C.	$30,000.00	BB. 5% of above		C.C.	$25,000.00	BB. 5% of above		C.C.	$30,000.00	C.C. C.C.	$7,000.00 $30,000.00	BB 5% of above		BB 5% of above	

★ Contract awarded Sept. 27, 1945
Contract executed Oct. 18, 1945

ϕ The extended total submitted in the Contract Proposal indicated that the Bidder probably meant $11.50 per $1000.

* Bidder probably meant $0.14 per pound for Item 14, instead of $14.00 which was the unit price bid written in words.
# $15.00 per thousand used, as the unit price bid, as written in words, exceeded the stipulated maximum.

Tabulated by: E.L.S.
Checked by: Z.E.B.

FILE CONT. 136 5.21N-1

Acc. 50,381

CANVASS OF BIDS FOR CONTRACT 137 ~ OPENED JULY 31, 1946

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
AS ENLARGED

CONTRACT 137

FOR THE CONSTRUCTION OF THE AERATION AND SEDIMENTATION TANKS; THE INFLUENT AND EFFLUENT CONDUITS; AND THE GRIT CHANNELS AND MAIN BUILDING SUBSTRUCTURE OF THE NUT ISLAND SEWAGE TREATMENT PLANT AT NUT ISLAND IN THE CITY OF QUINCY, MASSACHUSETTS

				① V. Barletta Co. 10 Whipple Ave. Roslindale Mass. ★		② Henry N. Worthington and Co. 159 Newport Ave. Quincy, Mass.		③ Marinucci Bros and Co. 51 Ceylon St. Dorchester Mass.		④ Gahagan Construction Corporation 11 Pemberton Sq Boston (8) Mass.		⑤ M. DeMatteo Construction Co. 200 Hancock St. Quincy, Mass.	
	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Excavation	Cu. Yd	40,000	1.50	60,000.00	3.00	120,000.00	1.80	72,000.00	2.20	88,000.00	1.00	40,000.00
2	Refill and embankment, unconsolidated	Cu. Yd.	25,000	.50	12,500.00	2.00	50,000.00	1.10	27,500.00	.33	8,250.00	.55	13,750.00
3	Refill and embankment, consolidated	Cu. Yd.	3,000	1.00	3,000.00	3.00	9,000.00	1.30	3,900.00	1.10	3,300.00	1.00	3,000.00
4	Crushed stone and screened gravel	Cu Yd.	2,000	3.50	7,000.00	4.50	9,000.00	2.50	5,000.00	5.50	11,000.00	4.00	8,000.00
5	Gravel	Cu Yd.	500	2.00	1,000.00	2.25	1,125.00	2.00	1,000.00	3.85	1,925.00	3.00	1,500.00
6	Concrete in Sedimentation and Aeration Tanks	Cu. Yd	10,000	33.50	335,000.00	26.00	260,000.00	34.00	340,000.00	31.35	313,500.00	73.29	732,900.00
7	Concrete in Influent and Effluent Conduits	Cu. Yd.	4,300	33.50	144,050.00	28.00	120,400.00	34.00	146,200.00	37.95	163,185.00	79.95	343,785.00
8	Concrete in Grit Channels and Main Building Substructure	Cu. Yd.	5,700	33.50	190,950.00	26.00	148,200.00	39.00	222,300.00	32.45	184,965.00	68.68	391,476.00
9	Expansion and vibration joint filler	Sq Ft.	1,500	.30	450.00	.30	450.00	1.00	1,500.00	1.65	2,475.00	.587	880.50
10	Rubbed Finish	Sq. Ft.	18,000	.15	2,700.00	.15	2,700.00	.20	3600.00	.22	3,960.00	.26	4,680.00
11	Portland cement	Bbl.	32,000	3.00	96,000.00	3.75	120,000.00	3.10	99,200.00	3.63	116,160.00	3.73	119,360.00
12	Reinforcing steel	Pound	2,500,000	.6½	162,500.00	.08	200,000.00	.08	200,000.00	.12	300,000.00	.087	217,500.00
13	Light steel work	Pound	175,000	.30	52,500.00	.45	78,750.00	.28	49,000.00	.39	68,250.00	.294	51,450.00
14	Cast Iron pipe and specials larger than 6 inches	Pound	32,000	.15	4,800.00	.19	6,080.00	.17	5,440.00	.22	7,040.00	.595	19,040.00
15	Cast iron pipe and specials 6 inches and under	Pound	15,000	.15	2,250.00	.18	2,700.00	.16	2,400.00	.28	4,200.00	.465	6,975.00
16	Miscellaneous ferrous metals	Pound	5,000	60	3,000.00	.75	3,750.00	.52	2,600.00	.77	3,850.00	.26	1,300.00
17	Galvanizing	Pound	160,000	.05	8,000.00	.08	12,800.00	.09	14,400.00	.11	17,600.00	.07	11,200.00
18	Miscellaneous non-ferrous metals	Pound	12,000	1.10	13,200.00	1.55	18,600.00	1.00	12,000.00	1.38	16,560.00	1.50	18,000.00
19	Miscellaneous lumber	M f.b.m.	15	300.00	4,500.00	230.00	3,450.00	200.00	3,000.00	550.00	8,250.00	533.00	7,995.00
20	Tile pipe, 8 inches and under	Lin. Ft.	700	5.00	3,500.00	1.50	1,050.00	2.00	1400.00	2.20	1,540.00	1.33	931.00
21	Tile pipe, 10 inches to 15 inches inclusive	Lin Ft.	500	5.00	2,500.00	3.00	1,500.00	3.00	1,500.00	4.40	2,200.00	2.80	1,400.00
22	Precast reinforced concrete pipe	Lin Ft	900	5.00	4,500.00	4.00	3,600.00	5.00	4,500.00	4.40	3,960.00	3.00	2,700.00
23	Transporting, caring for and setting metal work and equipment furnished by the Commission	Pound	1,200,000	.03	36,000.00	.08	96,000.00	.08	96,000.00	.06	72,000.00	.06	72,000.00
24	Connections to the existing High Level Sewer	Lump S.		10,000.00	10,000.00	7,500.00	7,500.00	11,000.00	11,000.00	15,400.00	15,400.00	5,000.00	5,000.00
25	Electrical conduits	Lump S.		8,000.00	8,000.00	8,077.00	8,077.00	9,000.00	9,000.00	9,900.00	9,900.00	7,743.00	7,743.00
26	Cleaning up	Lump S		2,500.00	2,500.00	5,000.00	5,000.00	6,000.00	6,000.00	10,430.00	10,430.00	5,000.00	5,000.00
	Sub-Totals (Items 1 to 26 incl.)				1,170,400.00		1,289,732.00		1,340,440.00		1,437,900.00		2,087,565.50
27	Furnishing Performance Bond, Rate per $1,000			8.00	9,363.20		19,345.98	15.00	20,106.60	15.00	21,568.50	10.00	20,875.65
	Totals				1,179,763.20		1,309,077.98		1,360,546.60		1,459,468.50		2,108,441.15
	Bid Security B.B. INDICATES BID BOND C.C. INDICATES CERTIFIED CHECK			C.C.	70,000.00	C.C.	*65,000.00	B.B.	75,000.00	B.B.	87,500.00	B.B.	110,000.00

★ Contract awarded July 31, 1946
Contract executed August 27, 1946

Tabulated by I.E.P.
Traced by E.J.B.
Checked by K.R.S. + V.C.S.

*Bid bond substituted for Certified Check Aug 15, 1946, Maryland Casualty Company $65,000.00

FILE CONT. 137 5.22 N-1

Acc. 50,526

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents its

TWENTY-SECOND AND FINAL ANNUAL REPORT

I. Organization and Administration

By the provisions of Chapter 583 of the Acts of 1947, the Metropolitan District Water Supply Commission was abolished and its functions, duties, obligations and properties were transferred to the Metropolitan District Commission and provision was made for a Division of Construction to be established under the Metropolitan District Commission.

Until the cessation of its activities on June 30, William T. Morrissey continued as Chairman, Louis B. Connors as Associate Commissioner, and Edward J. Kelley as Associate Commissioner until he was succeeded on September 18 by John R. Shaughnessy. R. Nelson Molt continued as Secretary.

The Headquarters Office of the Commission was maintained at 20 Somerset Street, Boston, and Field Offices were maintained at Quabbin Reservoir; Riverside, Newton; and at Houghs Neck, Quincy, at the site of the Nut Island Sewage Disposal Plant.

The Commission continued the works providing for additional water supply and also sewer projects authorized by Chapter 705 of the Acts of 1945.

The Legislature authorized by Chapter 575 of the Acts of 1947 a further sum of $4,000,000 for the construction of a pressure aqueduct system to supply water from Quabbin Reservoir to such cities and towns in and near the valley of the Chicopee River and its tributaries as may conclude agreements with the Metropolitan District Commission for the purchase of water. This act, together with Chapter 587 of the Acts of 1945, makes generally available to cities and towns within and without the Metropolitan Water District the waters impounded in Quabbin Reservoir.

II. Swift River Supply

Quabbin Reservoir continued to discharge over the spillway notwithstanding a draft during the first six months of 1947 of 8,125,000 gallons.

The Commission continued its maintenance of fire lanes and access roads and fire equipment within the Swift River watershed, and made available for the full use of the public the roads over Winsor Dam, Quabbin Hill and the Dike, as well as the parking space and convenience stations and observation tower on Quabbin Hill.

Cooperation with the United States Geological Survey was continued by the Commission on the Ware, Chicopee and Connecticut rivers, and further studies and investigations relative to supplying water from Quabbin Reservoir to the City of Chicopee and other cities and towns in the Chicopee River Valley and its tributaries were continued.

At the outlet works at Winsor Dam other work was continued for the generation of electrical energy.

III. WARE RIVER SUPPLY

The Commission publicly advertised for, received and opened bids on December 18, 1946, for installing the turbine, generator and valves for the generating plant at Shaft 1 of Quabbin Aqueduct, Oakham, Mass. Work has been in progress under this contract.

The Commission negotiated and executed on September 13, 1948, a contract with the New England Power Company for the sale and purchase of electrical energy to be developed at the Oakdale Station at Shaft 1.

The Holden-Rutland Sewer continued in operation and the Commission continued with plans and studies for disposing of sewage from Boylston and West Boylston within the Wachusett watershed area.

The Commission, at the request of the United States Army Engineers, permitted investigations to be made by them of the site of a proposed flood control dam; and its Chief Engineer conferred with the Army Engineers as to the details of the proposed flood control dam and reservoir, with special attention to the discharge of the waters so impounded.

IV. HULTMAN AQUEDUCT

The water from Wachusett Reservoir was discharged through this aqueduct into the Weston Aqueduct supply mains and the intake at Marlborough, control works at Shaft 4, Norumbega Reservoir Gatehouse and an emergency chlorinating plant were maintained. Work was in progress by Gerke Moore Company under the provisions of Contract 133 for the construction of an inverted siphon on the Wachusett Aqueduct at the Assabet River Crossing in Northborough.

V. CITY TUNNEL

The Commission publicly advertised for bids for the sinking of two shafts preliminary to the construction of the City Tunnel proper. These bids were opened October 30, 1946, and an award made to the lowest of six bidders, Marinucci Bros. & Co. of Dorchester, whose bid was $522,528.25. Work was at once started under the provisions of the contract after its execution on November 25, 1946.

The progress of the work was at the rate of about 12.9 feet per week at Shaft 6, located in Newton near the Newton Cemetery, and 9.2 feet per week at Shaft 7, near Lawrence Basin off Commonwealth Avenue.

By June 30th, the excavation of both shafts was practically completed and work was in progress in the area which is to be used for future tunnel operations. These two shafts comprise the last major construction work to be completed before the excavation of the proposed City Tunnel proper, designs for which have been substantially completed.

In addition, the Commission has considered an investigation and study to be made of a site for a proposed reservoir in the Blue Hills and the location of a line to convey water to it.

VI. FISCAL

The Commission hereto appends a copy of its expenditures for the fiscal year, and from the date of its appointment.

Metropolitan District Water Supply Commission
By WILLIAM T. MORRISSEY, *Chairman*

20 SOMERSET STREET, BOSTON, MASSACHUSETTS,
June 30, 1947.

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION AS ENLARGED BY CHAPTER 705 OF THE ACTS OF 1945

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Water Supply Commission, as enlarged by the provisions of Chapter 705 of the Acts of 1945, respectfully presents the

SECOND AND FINAL ANNUAL REPORT

I. Sewerage Projects

The Commission proceeded actively with the construction of the Sewage Treatment Plant at Nut Island, Houghs Neck in Quincy.

V. Barletta Company of Roslindale continued work under the provisions of Contract 136 for the excavation and filling at the site of the plant and proceeded to place the embankment therefor, completing the same in November. Riprap was also placed on the outer slopes and the off-shore drains were completed. By June 30th the provisions of the contract were substantially completed.

The Commission publicly advertised for proposals for the construction of a 12-inch sludge disposal line from Nut Island to President Roads which contained provisions for both surface and subaqueous work, and awarded the contract to the Bay State Dredging and Contracting Company of East Boston, the lowest bidder, whose proposal was $575,724.06.

Upon the execution of the contract on November 4th, work was immediately started.

An award was made by the Commission to V. Barletta Company of Roslindale, Mass., for the construction of aeration and sedimentation tanks, influent and effluent conduits, grit chambers, etc., in the main building substructure at Nut Island, in the amount of $1,179,763.20. The Commission publicly advertised for proposals on this contract and that of V. Barletta Company was the lowest one received.

Upon the execution of this contract, work was carried on in accordance with its provisions.

The Commission publicly opened and received proposals on June 10th for Contract 143, the provisions of which provided for the furnishing and delivering of mechanical equipment for the power plant, pumps, gates and valves for the Nut Island Plant. There were eleven items in the contract and the Commission awarded each of the eleven to the bidder submitting the lowest proposal therefor.

On April 26th, the Commission received bids for the construction of the concrete portion of the sludge digestion tanks for the Nut Island Plant and awarded the contract to the lowest bidder, Farina Brothers of Newton, Mass., whose proposal was $394,758.50.

The Commission's Engineering Force continued studies for the construction of the four other sewerage projects authorized by Chapter 705 of the Acts of 1945, and especially that of the Alewife Brook Storm Overflow Conduit which the Commission directed the engineers give immediate consideration to for its design.

On June 30th, in accordance with the provisions of Chapter 583 of the Acts of 1947, the enlarged Metropolitan District Water Supply Commission turned over to the Metropolitan District Commission the work on these projects so far as completed.

II. FISCAL

The Commission hereto appends a copy of its expenditures for the fiscal year, and from the date of its appointment.

Metropolitan District Water Supply Commission
By WILLIAM T. MORRISSEY, *Chairman*

20 SOMERSET STREET, BOSTON, MASSACHUSETTS.
June 30, 1947.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

GENTLEMEN:—The following is a report of the engineering department for the year ending June 30, 1947. On this date, the commission is abolished by law, and commencing July 1, its rights and duties are taken over by the Metropolitan District Commission, and its construction projects continued by a newly organized Construction Division of that Commission. Accordingly certain statistical data heretofore presented and published to cover the calendar years is not included in this report but the information covering the first six months of 1947 is turned over to the Water Division of the Metropolitan District Commission for subsequent inclusion in the report of that Commission for the entire calendar year 1947.

Miscellaneous work was continued on the Quabbin Reservoir access roads, fire lanes and fencing, and on seasonal clearing ahead of the water level, which on April 4 reached the flow line, Elev. 530. Work was continued on the installation of a waterwheel to generate electric power at Winsor Dam, and on the construction of the sewage treatment plant on the South Metropolitan system at Nut Island. Construction was commenced of the City Tunnel from Norumbega Reservoir to Chestnut Hill, and of the Assabet River siphon on the Wachusett Aqueduct. Designs were continued for the storm relief sewer in Alewife Brook, and studies underway for marginal relief conduits along the Charles River Basin from the North Metropolitan relief sewer extension, and for the proposed Blue Hill Reservoir.

ORGANIZATION

Stanley M. Dore, Assistant Chief Engineer, continued to act as deputy chief engineer.

Walton H. Sears, Mechanical Engineer, continued in charge of designs and specifications for plant and equipment.

Frederick W. Gow, Division Engineer, continued in charge of the Reservoir and Aqueduct Division, now to be superseded by the Field Office of the new Construction Division.

Lawrence M. Gentleman, Associate Civil Engineer, continued in charge of the detail work on design and contract and working drawings.

From time to time, the Commission employed the services of consulting engineers: Metcalf & Eddy of Boston, Greeley & Hansen of Chicago, James F. Sanborn of New York, and others.

The assignment of employees under the direction of the Chief Engineer at the end of the fiscal year and of the preceding year was as follows:

	June 30, 1946	June 30, 1947
Headquarters, Designing Division		
20 Somerset Street, Boston	52	53
Reservoir and Aqueduct Division		
Administration Building at Winsor Dam, Belchertown	24	23
Ware River Intake Building, Coldbrook	11	11
City Tunnel Office, 107 Charles St., Auburndale	67	82
Total Engineering Force	154	169

HEADQUARTERS OFFICE

Watershed Real Estate—The total area of real estate acquired for Quabbin Reservoir to June 30 is 80,998 acres, of which 37 acres were acquired during the year in the Town of New Salem. Settlements have been secured covering 79,276 acres.

The total area of real estate acquired for sanitary protection in the Ware watershed to June 30 is the same as previously reported, 21,097 acres. Settlements have been secured covering 20,024 acres.

Hultman Aqueduct and City Tunnel Real Estate—During the year, no additional takings of real estate were made for the City Tunnel. Of a total of 563 acres of land taken in fee and easement for the purposes of the Hultman Aqueduct, including the City Tunnel, settlements have been secured covering 560 acres.

Nut Island Sewage Treatment Plant Real Estate—During the year 26 acres of real estate were acquired for the Nut Island Sewage Treatment plant in Quincy.

Miscellaneous Real Estate—During the year 2.15 acres of land were acquired for Wachusett Watershed Protection and .05 acres of land acquired for the building of the Assabet River Siphon on Wachusett Aqueduct.

Water Diversion Damage Claims—Only incidental work was done on data in connection with the suit brought by the Ludlow Manufacturing Associates. Their appeal to the Supreme Court for adjudication of exceptions in the case has resulted in the granting by the Court of a new trial. A suit brought by John Handzel of Bondsville has been settled.

Record Drawings—Work was continued on the record drawings of the Hultman Aqueduct.

Hydrographic Data—Gaging stations were continued in cooperation with the United States Geological Survey on the Ware River at Coldbrook, on the East Branch of the Swift River at the regulating dam, on the Chicopee River at Indian Orchard, and on the Connecticut River at Thompsonville, Connecticut. Level recorders were also maintained by the Commission on the Chicopee River at Red Bridge and on Beaver Brook south of Quabbin Dike.

Examination of the waters of the Ware, Swift and Chicopee Rivers included analyses of samples taken.

Maintenance of Records—Records of assignments of lots and interments in Quabbin Park Cemetery were maintained. Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements. Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

Contracts and Specifications

Plans and specifications were prepared for the following contracts for which bids were opened during the fiscal years:

Contract 117, for constructing Shafts 6 and 7 of the City Tunnel portion of the Hultman Aqueduct in the cities of Newton and Boston.

Six bids were received October 30, 1946, for constructing both shafts, ranging from $522,528.55 to $810,731.25. In addition, two bids were received for constructing Shaft 6 only, and one bid for constructing Shaft 7 only, the lower combination of which for constructing the two shafts was more than the low bid for both shafts. The contract was executed November 25, with Marinucci Bros. & Company, Dorchester, Mass., the lowest bidder.

Contract 137, for constructing aeration and sedimentation tanks, influent and effluent conduits and grit channels in the main building substructure of the Nut Island Sewage Treatment Plant in the City of Quincy.

Five bids were received July 31, 1946, ranging from $1,179,763.20 to $2,108,441.15. The contract was executed August 27, with V. Barletta Company, Roslindale, Mass., the lowest bidder.

Contract 139, for constructing a 12 inch sludge disposal line from Nut Island to President Roads and two outfall diffusers in the Town of Hull and the cities of Quincy and Boston.

Four bids were received October 16, 1946, ranging from $575,724.06 to $1,044,542.00 The contract was executed November 4, with the Bay State Dredging & Contracting Company, East Boston, Mass., the lowest bidder.

Contract 143 (A, B, C, D, E, F, G, H, I, J, K), for furnishing and delivering mechanical equipment for the power plant, pumps, gates and valves for the Nut Island Sewage Treatment Plant in the City of Quincy. The advertisement for bids included also groups L and M, for four 60-inch flap gates and 24 small gate valves but no bids were received for these items. Bids were received June 10:

(A, B) Only one bid was received for one exhaust-heat-recovery boiler and silencer, for two 12-inch and two 6-inch engine-exhaust silencers, and for two 16-inch air-intake silencers and two 14-inch air-discharge silencers for blowers for the total sum of $7,682.00. The contract was executed September 2, 1947, with the Maxim Silencer Company, Hartford, Connecticut, the only bidder.

(C, D) Only one bid was received for three 4,000-cfm and two 800-cfm air cleaners and silencers and two electrostatic precipitator-type air filters for the total sum of $5,342.00. The contract was executed September 15,1947, with the American Air Filter Company, Inc., Louisville, Kentucky, the only bidder.

(E, I) Only one bid was received for Group E for two sludge heat exchangers for $14,782.00; and two bids for Group I for seven triplex plunger sludge pumps, for $36,501.00 and $37,776.00. The contract was executed September 8, 1947, with the Pacific Flush Tank Company, Chicago, Illinois, the only bidder for Group E, and the lower bidder for Group I.

(F) Only one bid was received for three heat exchangers for $2,827.00. The contract was executed September 9, 1947, with the Ross Heater Manufacturing Company, Inc., Buffalo, New York, the only bidder.

(G, H) Six bids were received for Group G for 23 centrifugal pumps, ranging from $13,883.99 to $17,469.00; and one bid for Group H for six screw-feed centrifugal pumps for $12,033.00. The contract was executed August 28, 1947, with the Chicago Pump Company, Chicago, Illinois, the lowest bidder for Group G, and the only bidder for Group H.

(J) Two bids were received for 24 sluice gates for $59.620.00 and $154,451.00. The contract was executed September 2, 1947, with the Chapman Valve Manufacturing Company, Indian Orchard, Mass., the lower bidder.

(K) Three bids were received for 8 dewatering and drainage pumps, ranging from $4,879.00 to $6,625.00. The contract was executed August 28, 1947, with the Hayes Pump and Machinery Company, Boston, Mass., the lowest bidder.

These were executed by the Metropolitan District Commission, all subsequent to June 30.

Contract 146, for constructing the concrete portion of four 110-foot diameter sludge-digestion tanks for the Nut Island Sewage Treatment Plant in the City of Quincy.

Sixteen bids were received April 29, ranging from $394,758.50 to $596,354.50. The contract was executed May 26, with Farina Bros., Newton, Mass., the lowest bidder.

Contract 151, for the sale and purchase of electric energy to be developed at the Oakdale Station at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston. This contract, executed September 13, 1946, was negotiated with the New England Power Company. Its principal provision is for the sale of electricity at 66,000 volts for 6.25 mills per kwh. from 7:00 A.M. to 11:00 P.M., Monday to Friday, inclusive, generally during the period from July 1 to February 28.

Contract 152 (A, B, C, D, E, F, G), for furnishing and delivering a waterwheel, generator, switchgear, transformer, substation and appurtenances and a penstock valve in the Town of West Boylston. Bids were received December 18, 1946:

(A) Three bids were received for the 5,000-h.p. single runner, vertical hydraulic turbine, ranging from $98,500.00 to $185,000.00. The equipment was purchased February 6, from the S. Morgan Smith Company, York, Pennsylvania, the lowest bidder, the price being subject to an escalator-clause increase by not more than 30%.

(B, C, D, F) Three bids were received for Groups B, C and F for the 4375-Kva., 6900-volt generator, for the switchgear, storage batteries and charging equipment, ranging from $100,662.00 to $109,371.00; and four bids for Group D for a 4375-Kva., 66,000 to 6900-volt transformer, ranging from $14,407.00 to $19,210.00 The contract was executed February 13, with the General Electric Company the lowest bidder, the price being subject to an escalator-clause increase by not more than 30%.

(E) Four bids were received for the switchgear and appurtenances, ranging from $8,154.95 to $8,975.00. The contract was executed March 10, with the Southern States Equipment Corporation, Hampton, Georgia, the lowest bidder, the price being subject to an escalator-clause increase by not more than 20%.

(G) Two bids were received for one 84-inch motor-operated penstock disc valve, for $22,500.00 and $31,850.00. However, the lower bidder offered a valve which did not meet the specifications either as to material or dimensions. The contract was executed February 13, with Chapman Valve Manufacturing Company, Indian Orchard, Mass., the only bidder to meet the specifications.

Design of Water Supply Projects

Studies and designs were continued of structures proposed to be constructed but not yet bid, as follows:

Wachusett Watershed Protection—Studies were continued in cooperation with the Quabbin Reservoir and Aqueduct Division of a system for diverting from the watershed of Wachusett Reservoir the sewage of Boylston and West Boylston.

Hultman Aqueduct—City Tunnel—Studies were continued of plans for the proposed future extension of the City Tunnel.

Distributing Reservoirs—Studies and designs were continued for the modification of, and new connections to, existing distributing reservoirs, which must follow the completion of the City Tunnel; and also for an additional distributing reservoir in the Blue Hills Reservation.

Barre Falls Flood Control Project—The Chief Engineer of the Commission continued as a member of an advisory board to assist the State Planning Board in its studies and recommendations to His Excellency the Governor on the Federal Government's Barre Falls flood control project and other similar Massachusetts projects.

Chicopee Valley Water Supply—Studies were continued of the possibility of supplying communities in the Chicopee River Valley with water from Quabbin Reservoir.

Design of Sewerage Projects

Actual construction was confined to Project No. 1, for the Nut Island Sewage Treatment Plant. Studies were continued on the other four sewerage projects authorized in Chapter 705 of the Acts of 1945, for the improvement of the Metropolitan Sewerage Systems.

Sewage Records—The collection of twenty-four-hour composite samples from the South Metropolitan sewer at about 8-day intervals for analysis of the amount of suspended solids was continued. The collection of samples at about 8-day intervals was commenced from various points along Alewife Brook for analysis of the amount of suspended solids and other pertinent data.

Project 2—Extension of North Metropolitan Relief Sewer—Studies were commenced of the requirements of an extension to the Deer Island pumping station, and its relation to a future sewage treatment plant at that point and to a relief connection from the South Metropolitan sewer.

Project 3—Alewife Brook Storm Overflow Conduit—Progress was made on the designs for the proposed conduit which will intercept objectionable overflows, and for a new pumping station.

Projects 4 and 5—Charles River Basin Storm Overflow Conduits Investigations were continued of conditions along both sides of the Charles River.

The recording of levels at the Fens Gatehouse of the Boston Marginal Conduit and at the Charles River Dam gatehouse of the Cambridge Marginal Conduit was continued. Studies were continued of the clogging of racks and gates in the Boston Marginal Conduit by debris from the unprotected openings into the Stony Brook Conduit of the City of Boston.

RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division continued in charge of all field work. In addition to supervision of construction work this consisted of: Topographic and real estate surveys in the watersheds, along the aqueducts, at the site of the proposed distributing reservoir in the Blue Hills, along the proposed City Tunnel and the proposed Alewife Brook Conduit and in connection with the other sewerage projects; reforestation; reservoir reclearing and work on fire lanes and access roads; the work of the water analysis laboratory; investigations in the Chicopee River Valley; the collection of data on flow in the South Metropolitan Trunk Sewer and the collection and analysis of sewage samples there and along Alewife Brook; and the maintenance and operation of Quabbin Park Cemetery, the Quabbin Reservoir release works at Winsor Dam, the Ware River Intake works at Coldbrook, Quabbin Aqueduct and Hultman Aqueduct and the Rutland-Holden trunk sewer.

Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the Intake Building at Barre, and daily rainfall records at Pelham, at Nichewaug and Harvard Forest in Petersham, at South New Salem, at North New Salem, at West Rutland and at the Quabbin Aqueduct Intake in Hardwick. Daily rainfall and temperature records were kept at the Administration Building at Belchertown. Continuous records were kept of the flow of the Swift River at Winsor Dam. Work was continued in the field offices on record plans in the Reservoir Area and along the Hultman Aqueduct.

The Department of Public Health continued its cooperation in the analysis of samples of water.

Quabbin Hill Building and the scenic highway between Winsor Dam and Quabbin Dike and the Quabbin Hill Observation Tower were closed for the winter season Nov. 14, 1946 and reopened to the public April 18.

The Belchertown office continued its records and management of the affairs of the former towns of Dana, Enfield, Greenwich and Prescott. Policing of the Quabbin Reservoir area was continued by the Metropolitan Police who were housed in the Administration Building. The work of constructing the second new residence for engineering personnel on Blue Meadow Road was continued with lumber and other materials salvaged from various buildings in the reservoir area.

Plans and studies were continued by the Coldbrook office of methods for disposing sewage in the towns of Boylston and West Boylston in the Wachusett watershed. Surveys were made to locate a power line connection from Shaft 1 of Quabbin Aqueduct to the substation of the New England Power Co., in West Boylston. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct. The chlorinating station on Mill Brook below the Central New England Sanatorium was maintained.

The Newton Office made additional surveys of the location of a pipe line connection to the proposed distributing reservoir in the Blue Hills area. Sewage level gages were continued on the South Metropolitan Sewer at the Fens Gatehouse of the Boston Marginal Conduit, and at the Charles River Dam chamber of the Cambridge Marginal Conduit.

Inspections were continued of conditions along the Stony Brook Conduit permitting the entrance of debris into the conduit. Extensive surveys were continued in the valley of Alewife Brook to determine the location of existing sewers and connections and other underground structures, and the extent and character of contributions from sewage and storm water from various sources.

Reforestation—No watershed planting was done during the year since, as previously reported, the available trees are now too large for economical use, with the exception of a small number of spruce not yet ready for transplanting.

300 red pine 7-year transplants were taken to the Coldbrook Office and used for miscellaneous replacement. 11,000 red and white pine 7-year and 8-year transplants were taken to the Newton Office and planted along the Hultman Aqueduct right-of-way. Also about 1,150 transplants were sold to individuals.

Work on white pine blister rust control in cooperation with the U. S. Department of Agriculture was continued until September 27, 1946, and resumed on April 14.

Floating Equipment—The use of the Commission's two largest boats, the "Enfield" and the "Greenwich," was continued for the transportation of workmen and their equipment to various sections of the reservoir for taking water samples and general utility work. The "Dana" remained in storage. The New England Power Company was permitted to house and use a boat to facilitate the maintenance of its 110,000-volt transmission line crossing the reservoir.

Fire Protection—Fire fighting equipment was maintained and ready for service at all times, one fire truck being stationed at Pelham Hill on the west side of the reservoir, one at Nichewaug near the reservoir intake to Quabbin Aqueduct, one near the Ware River Intake Works, and the remainder of the fire fighting equipment at the Administration Buildings. Additional equipment consisting of two trailer crash pumping units were purchased from the War Assets Administration. During the year the equipment and personnel responded to calls for assistance at nine forest fires in the Quabbin area. Work on fire access roads was continued by force account.

Quabbin Park Cemetery—A small labor force averaging 5 men was employed on cemetery work throughout the year. The vault was maintained ready for use, cemetery lots graded and seeded as required, the entire cemetery area properly maintained and driveways plowed and kept clear of snow throughout the winter months. Fourteen interments were made during the year. The Commission decided in January that complete removals should be made from Lincoln Cemetery, Petersham, to Quabbin Park Cemetery. Arrangements were in progress but no bodies were removed during the year.

Rutland-Holden Sewer

The Rutland-Holden Sewer was in continuous operation throughout the year. The entire length of the line and the meter stations at the Rutland State Sanatorium, at the United States Veterans' Hospital in Rutland, at the Rutland-Holden boundary line and at the Holden-Worcester boundary line were inspected regularly.

Laboratories

Park Road Laboratory—Weston—The Commission's laboratory for soil testing was continued with equipment previously moved from Belchertown to Weston. In the same building the analyzing of sewage samples was continued. This included the periodic testing throughout the year of composite 24-hour samples from the South Metropolitan Sewer at Nut Island, also the periodic testing of samples from Alewife Brook and from the Stony Brook Conduit.

The concrete laboratory was operated in connection with work under Contracts 117, 137, 139 and 146, testing aggregate for concrete and making compression tests on concrete specimens.

Water Analysis Laboratory—Belchertown—The taking and analyzing of samples from the Ware, Swift, Quaboag and Chicopee rivers was continued. The chemical and bacteriological analysis of the regularly scheduled samples from Quabbin Reservoir and tributary streams in the Swift and Ware watersheds was continued. The work has been under the general supervision of Clarence H. Reed, Assistant Sanitary Engineer of the Sudbury Section of the Water Division, Metropolitan District Commission.

Operation of Winsor Dam Outlet Works

The outlet works were maintained for practically the entire year. The required release of water was controlled over the main dam spillway. Repair of the cavitation in the 48" valve was completed in August and September 1946, with the construction in place of a new babbitt seat. Pending the completion of the waterwheel installation, the heating of the building was continued by the use of the hot air furnace previously transferred from the Quabbin Park Cemetery building. Both penstock lines from the intake to the outlet works, the 48-inch line embedded in the invert of the stream control tunnel and the 68-inch line laid on the fill inside the tunnel, were drained and inspected and found to be in good condition. The lining of the side walls and arch of the tunnel itself above the fill was also inspected on March 21, and found to be in good condition. One small area of the lining was patched with cement mortar.

Operation of Quabbin Aqueduct

The Reservoir intake works at Shaft 12 of Quabbin Aqueduct, the Ware River intake works at Shaft 8, and the outlet works at Shafts 1 and 11A were kept ready for operation with the fine racks in place at Shafts 12 and 8, and with an auxiliary rack on the invert at the bottom of the tunnel at Shaft 9.

The Quabbin Aqueduct tunnel was entered and inspected between Shaft 12 and Shaft 8 on October 8, 1946, and between Shaft 8 and Shaft 4 on October 15. The tunnel lining was found to be in very good condition.

Operation of Hultman Aqueduct

The discharge of water directly from Wachusett Reservoir through the new Hultman Pressure Aqueduct and through the 7-foot diameter by-pass into the Weston Aqueduct supply mains was continued throughout the year. The Hultman Aqueduct intake works in Marlboro, the control works at Shaft 4 below the Sudbury Dam, and the Norumbega Reservoir gatehouse and emergency chlorinating plant were maintained with the fine racks in place at the intake, and fine screens in the Norumbega gatehouse.

Progress of Construction Contracts

Contract 117—Contract 117, for the construction of Shafts 6 and 7 of the City Tunnel was started during the first week of December, 1946, with clearing and the grading of access roads to the sites. An existing wood road into the Newton Cemetery property on Commonwealth Avenue was regraded and used for access during most of the year until the spoil area could be brought to the grade of the permanent easement. At Shaft 7, the existing access road from Chestnut Hill Drive was used throughout the year being graded and maintained with shaft spoil. The Contractor started erecting his plant buildings at both shafts about the middle of December. Powder magazines were erected at both shafts in compliance with the rules of the Department of Public Safety. Electric power was used and purchased from the Boston Edison Company. The total consumption to June 30, was 130,000 K.W.H. at Shaft 6, and 115,470 K.W.H. at Shaft 7.

At Shaft 6, the sanitary provisions included a 1,000 gallon septic tank completed January 9. At Shaft 7, connection was made to the sewer of the City of Boston in Beacon Street. This connection involved about 900 feet of 8-inch sewer pipe, and was completed in December. Water pumped from Shaft 6 was discharged into a settling basin in the spoil area, and from Shaft 7 into the unused Lawrence Basin of Chestnut Hill Reservoir. The Contractor was allowed to lower the Lawrence Basin level from Elev. 134.5 to Elev. 127.9 during the latter part of February, after which it rose gradually to 130.4 at the end of the year. The excavation at both shafts was practically dry and only 264 million foot-gallons were pumped during the year at Shaft 6, and 230 at Shaft 7. To isolate the shaft sites for operations under this contract and the proposed main tunnel contract, 886 feet of chain link fence was erected along Commonwealth Avenue at Shaft 6, and 724 feet at the intersection of Chestnut Hill Drive and Chestnut Hill Driveway at Shaft 7.

Earth excavation at both shafts was done in open-cut using a power shovel or back-hoe, as conditions warranted. At Shaft 6, the average depth of overburden was 24 feet, from average surface Elev. 140.9 to average ledge Elev. 116.9. Muck was removed by bucket and crane until the excavation had reached Elev.-45.0., when the operations were halted for the erection of a steel headframe and stationary hoist. At Shaft 7, the overburden was less than 8 feet deep from average surface Elev. 140.4

to average ledge Elev. 132.7, and the headframe and hoist were installed after the muck had been excavated by bucket and crane to Elev. 21.0. At Shaft 7, an air-operated mucking machine operated from two rails spanning the shaft just above the muck pile was installed after the excavation had reached Elev. 12.0. At Shaft 6, the earth was supported by timbering until the concrete lining was placed. No support was required in the rock. At Shaft 6, the west tunnel heading was started May 15; and the east heading, May 16. The muck was loaded by hand into buckets on flat cars until January 9, when an electrically operated dragline-type mucking machine was installed. Steel forms were used for lining the shafts with concrete, which was delivered to the sites by transit mixers and lowered and placed from 1 cubic yard and ½ cubic yard buckets.

The following tabulation gives the details of the progress of the shafts and tunnel in rock.

	Shaft 6	*Shaft 7*
Rock Excavation	from Elev. 116.9, Jan. 3 to Elev. −154, May 14	from Elev. 132.7, Jan. 10 to Elev. −85, June 30
Concrete Lining	from Elev. 138, Jan. 16 to Elev. −134, May 5	from Elev. 139.0, Feb. 28 to Elev. −83.4, June 27
Average Progress Sinking and Lining	14 feet per week	9 feet per week
Average Use of Dynamite	4.8 lbs. per cu. yd.	2.3 lbs. per cu. yd.

	East Heading, Shaft 6	*West Heading, Shaft 6*
Tunnel Excavation	161.1 feet, May 16 to June 30	68.1 feet, May 15 to June 10
Average Progress	25. feet per week	19 feet per week
Average Use of Dynamite	6.7 lbs. per cu. yd.	6.2 lbs. per cu. yd.

At the end of the year, June 30, the excavation of Shaft 7 lacked about 19 feet of completion and none of the tunnel headings at Shaft 6 had reached the limiting distance from the shaft of 200 feet specified in the contract.

The value of work included in contract estimates to July 1, the date of the latest estimate, was $333,355.64, of which 90 per cent has been approved for payment. The Contractor worked three 8-hour shifts daily except Sunday, and his force average 40 men, the maximum being 106 for the week ending April 12.

The principal items of equipment used were:

1 100 H.P. Motor-Driven 7-ton Mining Hoist at each shaft.
1 Air Motor-driven shaft Mucking Machine at Shaft 7 with 9 cubic foot bucket.
1 Dragline Type 2500 H.P. Motor-operated Mucking Machine.
1 Motor-driven 1700 cfm Air Compressor at Shaft 7.
1 Smaller Air Compressor at Shaft 6.
1 Electric Welder.
Drills, trucks, etc.

Contract 133—Contract 133, for constructing an inverted pipe siphon on Wachusett Aqueduct at the Assabet River Crossing in Northborough was started in March with the delivery of several loads of timber at the site, orders having been placed for the fabrication of the steel pipe in the middle of September. Commencing June 16, the New England Power Company relocated the nearby high tension line, and on June 18 the Contractor started erecting plant buildings. No estimate for payment was made. The Contractor's force averaged six men.

Contract 136—Contract 136, for excavation and filling at the site of the Nut Island Sewage Treatment Plant in Quincy was continued throughout the year. The placing of embankment was completed late in November. The placing of riprap along the outer slope, and the marine ramp was continued and was substantially complete October 7. An agreement was made under which the removal of the old pier will be omitted, and completed under Contract 139. The laying of the 60-inch precast reinforced concrete offshore drain was completed July 13, but the Contractor was permitted to postpone the construction of the headwall and tide gate installation in order to use the cofferdammed area at the outlet end as a pump sump for work under Contract 137. With these exceptions, the work was substantially complete at the end of the year.

The value of work included in contract estimates to December 1, 1946, the date of the latest estimate, was $454,294.71, of which 90 per cent has been approved for payment. The Contractor's force averaged 5 men.

Contract 137—Contract 137, for constructing the aeration and sedimentation tanks, influent and effluent conduits, grit channels and main building substructure of the Nut Island Sewage Treatment Plant in Quincy was started August 28, with the excavation by bulldozer and dragline at the tank sites. Plant buildings erected under Contract 136 were continued in use for this contract. The excavation for the tanks was completed early in December, and screened gravel placed over areas and rolled. Concrete was brought to the site in transit mixers. Construction of floor slabs for the tanks was begun November 6, and the tanks including side, intermediate and connecting walls was about 59 per cent complete at the end of the year, with 5925 cubic yards of concrete in place. Commencing October 25, 570 feet of 18-inch concrete drain pipe was laid beneath the tanks. This item was about 65 per cent complete at the end of the year. Work on the influent and effluent conduits was begun early in March, and was 11 per cent complete at the end of the year with 465 cubic yards of concrete in place. Commencing January 17, sheet steel piling was driven at the influent ends of the sedimentation tanks along the toe of the existing trunk sewer embankment. Excavation for the main building was begun early in June on the construction of a temporary storage warehouse for metal work and equipment which will be delivered to the site under other contracts and transported and cared for under this contract. The entire work was about 38 per cent complete at the end of the year

The value of work included in contract estimates to July 1, the date of the latest estimate, was $452,230.19, of which 90 per cent has been approved for payment. The Contractor's force average 25 men.

The principal items of equipment used were:

2	Diesel operated cranes with 80-foot booms.
1	Truck crane with 70-foot boom.
1	Gas-operated shovel, 1½ cu. yd. capacity.
2	Bulldozers.
1	Gas-operated roller.
	Pumps, trucks, woodworking equipment, etc.

Contract 139—Contract 139, for constructing the 12-inch sludge disposal line from Nut Island to President Roads, and the outfall diffusers, was started April 18, when an instrument platform was constructed at the end of the first leg of the sludge line in the harbor off Long Island. The land portion of the work on Long Island is being done by Coleman Brothers, subcontractors. Commencing May 14, they had completed during the year 3484 feet of trench excavation with a dragline crane; and commencing May 21, 3328 feet of 12-inch mechanical joint pipe in 16-foot lengths. Dredging the trench for the subaqueous portion of the line was started May 12, and at the end of the year 8470 feet of trench were excavated by a steam dredger with a five cubic yard clam shell bucket. The 12-inch Victaulic joint pipe in 12-foot lengths was assembled on the deck of a lighter. Six lengths of pipe were jointed, attached to a strong-back, lowered over the side and joined to the pipe in place with a Victaulic coupling by divers. The first pipe was placed June 17, and at the close of the year 2034 feet have been placed.

Work was also started on the precast domes of the diffusers and their appurtenances to be placed over the existing outlets. This work was done in Roxbury with transit-mixed concrete.

The value of work included in contract estimates to July 1, the date of the latest estimate, was $183,836.62, of which 90 per cent has been approved for payment. The Contractor's force average 42 men.

The principal items of equipment used were:

1	Crane with 70-foot boom, 2 cubic yard bucket.
1	Bulldozer.
2	Steam Dredgers.
3	Tug Boats.
3	Mud Scows.
	Trucks, small boats, tenders, compressors, hose, etc.

Contract 146—Contract 146, for construction of the concrete portion of the sludge digestion tanks for the Nut Island Sewage Treatment Plant in Quincy, was started June 4. Excavation for one of the four tanks was begun June 14, and the placing of reinforcing steel in floor and side forms started June 24. No estimate for payment was made. The Contractor's force averaged 11 men.

Contract 147—Contract 147, for surfacing Sea Avenue and Island Avenue in Quincy, as permanent access road to the Nut Island Sewage Treatment Plant, was continued to completion September 7. The final estimate dated November 12, 1946, was for $16,456.67. The Contractor's force averaged 3 men.

Contract 150—Contract 150, for installing the hydro-electric equipment in the Winsor Dam Outlet Works was continued throughout the year. The installation of the waterwheel, with draft tube, scroll case, relief valve and other appurtenances, was started July 15, 1946, and the placement of concrete September 5. This portion of the work was practically complete at the end of the year. The installation of the generator was delayed by an unfortunate accident in transit. It was delivered in a damaged condition and the rotor was removed and shipped to the nearest convenient machine shop in Holyoke on November 14, 1946, where tests showed that the shaft was sprung out of line. The guide bearings were also found to be out of shape. The above materials were returned to the factory, a new shaft installed, new bearings furnished and delivery made on April 21; but four field coils were damaged in this second shipment involving still further delay, and their replacement at the outlet works by the manufacturer. Reassembly was completed on June 20, and the work of installation was in progress at the end of the year. The work of setting the switchgear in place and erecting the outdoor substation was continued and practically completed. Work on the erection of the 22,000-volt transmission line was continued to completion, and the installation, conduit wiring and appurtenances between the generator and the outdoor station was about 90 per cent at the end of the year.

The value of work included in contract estimates to June 15, the date of the latest estimate, was $32,142.90, of which 90 per cent has been approved for payment, this being in addition to payments made to the manufacturers under Contracts 149 A-F. The Contractor's force averaged 3 men.

Storage and Flow Records

Quabbin Reservoir Storage and Release—Storage in Quabbin Reservoir continued. The following is a continuation of the information tabulated in previous reports. The figures for total storage show the quantity above the sill of the lower intake in Quabbin Aqueduct, Elev. 528.00. Below this sill and hence not available for draft to Wachusett Reservoir, there are about 10,000 million gallons above the reservoir bottom. The water level continued to rise from the previously reported Elev. 528.58 on December 31, 1946, to:

High Point on January 27	528.93
Low Point on February 12	528.41
High Point on May 8	530.56
Low Point on May 22	530.38
High Point on May 27	530.54

At the end of the previous fiscal year June 30, 1946:

Elevation of Main Reservoir	529.36
Total Storage	411,600 M.G.

At the end of the fiscal year June 30, 1947:

Elevation of Main Reservoir	530.24
Drawn to Wachusett Reservoir in the first six months of 1947:	8,125 M.G.
From	Jan. 27
To	Feb. 11

Released in the first six months of 1947 over spillway and through control works in excess of legal requirements:

January	547 M.G.
February	225 " "
March	961 " "
April	6,257 " "
May	8,688 " "
June	4,814 " "

Ware River Diversion—No Ware River water was diverted into Quabbin Aqueduct during the 12 months ending June 30. The following is a continuation, for the first six months in 1947, of the information published in previous reports:

Released in 1947, during the diversion period prior to June 15, in excess of legal requirements:

January	915 M.G.
February	2,350 " "
March	4,024 " "
April	4,435 " "
May	2,532 " "
June	222 " "

Delivery from Hultman Aqueduct to Disbribution System—Pending the extension of Hultman Aqueduct to Chestnut Hill by way of the proposed City Tunnel the limited use of the aqueduct has been continued. The number of gallons delivered to the distribution system monthly during the first six months of 1947 was as follows:

January	2,202,590,000 Gals.
February	1,926,640,000 "
March	2,049,510,000 "
April	1,959,140,000 "
May	2,004,130,000 "
June	2,000,090,000 "

List of Drawings and Tables Appended Hereto

Status of Contracts completed during the fiscal year ending June 30, 1947
Status of Contracts in force on June 30, 1947
Canvass of Bids, Contract 117
Canvass of Bids, Contract 139
Canvass of Bids, Contract 146

Respectfully submitted,

Karl R. Kennison,
Chief Engineer.

STATUS OF CONTRACTS COMPLETED BETWEEN JUNE 30, 1946 TO JUNE 30, 1947

Contract No.	Description	Contractor.	No. of Bids *	Contract Executed	Basis of Award	Final Estimate	Date of Final Estimate
147	Bituminous surface, Sea & Island Ave., Quincy	V. Barletta Co.	2	6/27/46	$15,288.81	$16,456.67	11/12/46

STATUS OF CONSTRUCTION CONTRACTS IN FORCE ON JUNE 30. 1947

Contract No.	Description	Contractor	No. of Bids*	Contract Executed	Basis of Award	Payments To Date
117	Construction of Shafts 6 and 7 City Tunnel, Boston and Newton	Marinucci Bros. & Co.	9	11/26/46	$522,528.55	$300,020.08
133	Inverted Pipe Sludge, Northborough	Berke-Moore Co., Inc.	6	8/28/46	197,758.00	None
136	Fill at Nut Island	V. Barletta Co.	8	10/18/45	478,814.36	408,865.25
137	Tanks & Foundation at Nut Island	V. Barletta Co.	5	8/27/46	1,179,763.20	319,801.48
139	Digested Sludge Line at Nut Island	Bay State Dredging & Contracting Co.	4	11/4/46	575,724.06	165,452.96
141 A & B	Engine, Generators, Blowers and Pumps at Nut Island	Worthington Pump & Machinery Company	5	5/31/46	330,374.00	None
142 A to H	Grit and Sludge Removal Equipment and Screens at Nut Island	Jeffrey Mfg. Co.	13	3/26/46	137,927.00	None
142 I	Comminutors	Chicago Pump Co.	1	3/19/46	40,244.00	None
144 A	Traveling Crane at Nut Island	Robert Abel, Inc.	1	9/17/46	4,665.00	None
144 B	Traveling Cranes, Chain Hoist, etc.	Robert Abel, Inc.	1	9/17/46	8,513.35	4,613.71
144 C	Diffuser Tube Aeration System	Chicago Pump Co.	1	9/16/46	33,954.00	None
144 D	Venturi Meters	Builders-Providence, Inc.	1	9/17/46	10,831.00	None
144 E	Two Covers for Secondary Digestion Tanks	Pacific Flush Tank Co.	1	10/3/46	51,974.00	None
144 F	Supernatant Selectors	Pacific Flush Tank Co.	1	10/3/46	3,114.00	None
144 G	Chlorinating Equipment	Wallace & Tiernan Co., Inc.	2	9/23/46	48,927.00	None
146	Four Digestion Tanks at Nut Island	Farina Bros.	16	5/16/47	394,758.50	None
149 A	Hydraulic Turbine at Winsor Dam	S. Morgan Smith Co.	2	6/25/45	27,953.00	$22,641.93
149 B	Generator	Electric Machinery Mfg. Company	3	7/16/45	17,192.00	None
149 C, E, F	Substation, Switchgear and Storage Battery	General Electric Co.	2	6/5/45	15,008.00	12,025.98
149 D	Transformer	Erie Electric Co.	3	6/5/45	4,299.00	3,095.28
150	Installing Power Plant at Winsor Dam	Berke-Moore Co., Inc.	2	3/27/46	39,198.10	28,928.61
152 A	5,000 H.P. Turbine for Oakdale Station	S. Morgan Smith	3	2/6/47	98,500.00	None
152 B, C, D, F	4,375 Kva Generator, Switchgear, etc.	General Electric Co.	4	2/13/47	115,069.00	None
152 E	Oakdale Substation	Southern States Equipment Corp.	4	3/10/47	8,154.95	None
152 G	84" Penstock Valve	Chapman Valve Mfg. Company	2	2/10/47	31,850.00	None

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* The above contracts were all awarded to the lowest bidder except No. 133 for which the low bidder did not fully meet the requirements of the specifications.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR, AND FROM JULY 28, 1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION ON ACCOUNT OF METROPOLITAN WATER SUPPLY CONSTRUCTION FUND

GENERAL OVERHEAD

ADMINISTRATION, *Commissioners' Office:*	Year Ending June 30, 1947	Total to June 30, 1947
Total Except the Following Listed Items	$0.00	$16,092.84
Salaries, Commissioners	5,000.00	208,961.54
Salaries, Clerical	20,380.04	295,545.94
Rent and Upkeep	2,314.16	48,169.81
Labor	761.60	761.60
Automobile Maintenance	403.12	6,751.13
Miscellaneous Expenses (undistributed)	247.78	29,696.63
Printing and Blueprinting	623.41	15,632.11
Stationery and Office Supplies	135.63	5,658.75
Advertising	305.99	15,543.41
Postage	120.00	3,792.13
Total Administration, Commissioners' Office	$30,291.73	$646,605.89

ENGINEERING, *Headquarters Office:*		
Total Except the Following Listed Items	$0.00	$211,932.57
Salaries, Engineering	32,795.17	1,312,770.26
Salaries, Clerical	9,778.62	263,481.34
Salaries, Engineering, Pension	1,470.00	9,432.50
Engineering Instruments	42.00	42.00
Rent and Upkeep	6,087.85	195,188.37
Automobile Maintenance	381.32	7,410.94
Miscellaneous Expense (undistributed)	551.27	28,368.24
Printing and Blueprinting	1,008.34	21,425.45
Stationery	70.97	9,963.86
Postage	368.40	5,261.98
Total Engineering, Headquarters Office	$52,553.94	$2,065,277.51
TOTAL GENERAL OVERHEAD	$82,845.67	$2,711,883.40

DISTRIBUTION OF GENERAL OVERHEAD

ADMINISTRATION, *Commissioners' Office:*		
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$4.599.50	$135,055.27
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	$0.00	$129.21
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	0.00	31,536.46
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	0.00	173.20
Quabbin Reservoir (PWA)	0.00	1,589.11
Quabbin Reservoir (except PWA)	5,936.87	299,978.76
Winsor Dam (except PWA)	2,712.93	82,387.11
Winsor Dam (PWA)	0.00	193.84
Quabbin Dike	0.00	30,357.31
Special Investigations	0.00	4,298.45
Southern Sudbury Emergency Supply	0.00	8,690.28
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	15.15	16,063.87
Weston Aqueduct Siphons (PWA)	0.00	423.11
Hultman Aqueduct (Supply Section) (PWA)	0.00	6,771.17
Hultman Aqueduct (Supply Section) (except PWA)	573.42	6,270.10
Hultman Aqueduct (Distribution Section) (PWA)	0.00	5,976.56
Hultman Aqueduct (Distribution Section) (except PWA)	16,453.86	32,065.28
Spot Pond By-Pass (PWA)	0.00	430.30
Enlargement of Fells Reservoir (PWA)	0.00	170.04
Total Administration, Commissioners' Office	$30,291.73	$662,559.43

ENGINEERING, Headquarters Office:	Year Ending June 30, 1947	Total to June 30, 1947
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct (except PWA)	$7,979.79	$447,860.27
Ware Supply, including Wachusett-Coldbrook Tunnel Section (PWA)	0.00	1,622.20
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (except PWA)	0.00	118,186.93
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct (PWA)	0.00	292.03
Quabbin Reservoir (PWA)	0.00	16,854.90
Quabbin Reservoir (except PWA)	10,300.05	979,914.86
Winsor Dam (except PWA)	4,706.73	241,177.42
Winsor Dam (PWA)	0.00	6,333.58
Quabbin Dike	0.00	111,584.71
Special Investigations	0.00	19,863.79
Southern Sudbury Emergency Supply	0.00	33,407.97
Wachusett Watershed Protection and Elimination of Pollution (except PWA)	26.27	43,805.02
Wachusett Watershed Protection (PWA)	0.00	450.95
Weston Aqueduct Siphons (PWA)	0.00	5,722.73
Hultman Aqueduct (Supply Section) (PWA)	0.00	114,472.88
Hultman Aqueduct (Supply Section) (except PWA)	994.85	17,134.63
Hultman Aqueduct (Distribution Section) (PWA)	0.00	72,793.01
Hultman Aqueduct (Distribution Section) (except PWA)	28,546.25	74,456.00
Spot Pond By-Pass (PWA)	0.00	13,611.66
Enlargement of Fells Reservoir (PWA)	0.00	6,898.94
Total Engineering, Headquarters Office	$52,553.94	$2,326,444.48

WARE SUPPLY (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$4,599.50	$135,055.27
Engineering, Headquarters Office	7,979.79	447,860.27
Total General Overhead	$12,579.29	$582,915.54
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$30,326.09
Salaries, Engineering and Clerical	2,708.20	436,861.80
Consultant Expense	412.51	11,872.46
Labor	18.25	9,875.16
Miscellaneous Expense (undistributed)	1.25	11,673.32
Printing and Blueprinting	1.05	1,340.81
Stationery and Office Supplies	4.18	3,337.05
Postage	0.00	526.61
Automobile Purchase	2,000.00	13,690.29
Automobile Maintenance	41.25	19,877.29
Rent and Upkeep	120.00	24,126.34
Total Engineering	$5,306.69	$563,507.22
REAL ESTATE—GENERAL CONSTRUCTION:		
Total Except Special Agents	$0.00	$155,484.33
Special Agents—Salaries, Engineering	57.00	17,658.49
Total Real Estate	$57.00	$173,142.82
WARE WATERSHED:		
Total Except the Following Listed Items	$0.00	$294,599.98
Salaries, Engineering and Clerical	13,066.38	214,561.72
Legal and Expert Expense	150.45	43,048.86
Labor	3,180.84	93,025.08
Automobile Purchase	3,290.67	8,178.65
Automobile Maintenance	548.54	15,959.02
Compensation Payments to Employees Injured on Work	605.71	1,416.56
Miscellaneous Expense (undistributed)	2.59	8,769.53
Printing and Blueprinting	27.93	1,207.08
Stationery and Office Supplies	4.18	972.69
Postage	6.00	215.82
Labor on Automobiles and Mechanical Equipment	299.38	299.38
Maintenance of Mechanical Equipment	79.65	721.25
Rent and Upkeep	437.05	1,858.70
Purchases and Settlements (including Certificate of Judgment)	7,550.00	1,706,458.28
Taxes	16,401.90	170,066.80
Fire Stops and Fire Access Roads, Labor	1,487.20	39,543.30
Other Forestry Work and Hurricane Clearing, Labor	505.75	13,403.93
Total Ware Watershed	$47,644.22	$2,614,306.63

	Year Ending June 30, 1947	Total to June 30, 1947
WARE DIVERSION DAMAGES:	$0.00	$1,429,557.92
PERMANENT CONSTRUCTION:	0.00	9,842,117.40
Total Ware Supply, including Wachusett-Coldbrook Section of Quabbin Aqueduct (Except PWA)	$65,587.20	$15,205,547.53
WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT (PWA ONLY)	$0.00	$107,531.91
TOTAL WARE SUPPLY, INCLUDING WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT	$65,587.20	$15,313,079.44
COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT		
Total Expenditure	$0.00	$5,422,684.86
QUABBIN RESERVOIR (PWA ONLY)	0.00	$2,086,051.39
QUABBIN RESERVOIR, NOT INCLUDING WINSOR DAM AND QUABBIN DIKE (EXCEPT PWA)		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$5,936.87	$299,978.76
Engineering Headquarters Office	10,300.05	979,914.86
Total General Overhead	$16,236.92	$1,279,893,62
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$73,032.96
Salaries, Engineering and Clerical	17,028.57	804,480.87
Consultant Expense	1,237.49	14,794.63
Labor	787.17	135,687.94
Tools and Equipment	135.76	3,646.17
Rent and Upkeep	56.90	45,770.57
Maintenance of Mechanical Equipment	187.60	4,092.68
Automobile Purchase	2,093.78	30,035.36
Automobile Maintenance	1,493.13	64,128.47
Miscellaneous Expense (undistributed)	179.26	24,908.02
Printing and Blueprinting	44.20	4,191.51
Stationery and Office Supplies	7.04	10,556.30
Postage	37.00	2,995.39
Labor on Automobiles and Mechanical Equipment	739.08	5,710.55
Total Engineering	$24,026.98	$1,224,031.42
REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:		
Total Except the Following Listed Items	$0.00	$926,779.03
Legal and Expert Expense	288.00	193,900.43
Labor	607.24	33,313.01
Miscellaneous Expense (undistributed)	1,052.91	13,023.37
Printing and Blueprinting	4.96	1,840.58
Maintenance of Real Estate	80.30	18,622.84
Purchases and Settlements	1,700.00	7,323,678.77
Taxes	18,205.92	609,491.45
Fire Protection—Equipment	586.00	13,267.58
Sub Total Real Estate—Except Awards by Court Decree	$22,525.33	$9,133,917.06
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES	$0.00	$317,875.42
REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Total Except Settlements made by Attorney General, etc.	0.00	103,521.03
Settlements made by Attorney General on Petition brought in Superior Court prior to Judgment	2,000.00	83,771.69
Sub Total Real Estate, Jury Verdicts	$2,000.00	$187,292.72
Total Real Estate	$24,525.33	$9,639,085.20
QUABBIN RESERVOIR DAMAGES:	$0.00	$82,779.78
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE AND PAYMENTS TO COUNTIES:		
Total Except the Following Listed Items	$0.00	$1,352,553.16
Salaries, Engineering and Clerical	4,337.06	144,869.57
Legal and Expert Expense	15.00	6,027.53
Labor	132.60	19,658.49
Sub Total Swift Diversion Damages—Except Awards by Court Decree	$4,484.66	$1,523,108.75
SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) AWARDS BY COURT DECREE—JURY VERDICTS:		
Total Except the Following Listed Items	$0.00	$323,897.26
Legal Expense	529.59	49,586.52
Printing and Blueprinting	199.13	1,569.57
Sub Total Swift Diversion Damages—Awards by Court Decree—Jury Verdicts	$728.72	$375,053.35

	Year Ending June 30, 1947	Total to June 30, 1947
Swift Diversion Damages—Payments to Counties for Reimbursement and Expenses of Litigation in County Courts:	$0.00	$4,307.05
Total Swift Diversion Damages (Including Beaver Brook)	$5,213.38	$1,902,469.15
Quabbin Reservoir—Liquidation of Towns		
Town Obligations:		
Town of Enfield	$954.55	$34,385.94
Town of Greenwich	45.16	14,116.34
Town of Prescott	47.28	5,933.56
Town of Dana	37.61	36,840.84
Sub Total Town Obligations	$1,084.60	$91,276.68
Quabbin Reservoir—Liquidation of Towns		
Liquidating Expenses:	$682.28	$20,841.13
Total Quabbin Reservoir—Liquidation of Towns	$1,766.88	$112,117.81
Quabbin Reservoir Cemeteries (Except PWA):	$0.00	$265,762.32
Permanent Construction—Construction Contracts:	$0.00	$785,263.49
Permanent Construction—Awards by Court Decree—Actions for Breach of Contract:	$0.00	$22,316.54
Other Permanent Construction—Except Clearing	$0.00	$16,458.83
Other Permanent Construction—1936 Clearing Projects:		
Compensation Payments to Employees Injured on Work	$625.72	$47,783.97
All Other Items	0.00	1,794,652.10
Sub Total 1936 Clearing Project	$625.72	$1,842,436.07
Other Permanent Construction—WPA Clearing Projects	$0.00	$3,387.76
Other Permanent Construction—Reservoir Clearing Not Including Clearing Projects:		
Total Except the Following Listed Iitems	$0.00	$1,537.39
Salaries, Engineering	1,392.55	10,771.37
Labor	30,386.06	286,066.88
Compensation Payments to Employees Injured on Work	1,369.35	2,147.41
Tools and Equipment	157.18	1,038.04
Medical and Surgical Services	41.00	705.75
Automobile Maintenance	224.28	502.94
Labor on Automobiles and Mechanical Equipment	144.02	144.02
Sub Total Reservoir Clearing Not Including Clearing Projects	$33,714.44	$302,913.80
Total Quabbin Reservoir Permanent Construction	$34,340.16	$2,972,776.49
Highway and Public Utility Relocation:	$0.00	$1,389,807.47
Quabbin Reservoir Watershed—Reforestation Nurseries:		
Total Except Salaries	$0.00	$126,918.75
Salaries, Engineering and Clerical	85.00	9,181.58
Sub Total Reforestation—Nurseries	$85.00	$136,100.33
Quabbin Reservoir Watershed — Reforestation Watershed Planting:		
Total Except the Following Listed Items	$0.00	$4,811.62
Salaries, Engineering and Clerical	297.38	7,751.92
Labor	158.40	102,337.81
Sub Total Reforestation—Watershed Planting	$455.78	$114,901.35
Quabbin Reservoir Watershed—Reforestation—Fire Stops and Fire Access Roads:		
Total Except the Following Listed Items	$0.00	$9.088.82
Salaries, Engineering	92.75	3,857.61
Labor	35,359.00	99,095.26
Automobile Maintenance	7.12	987.98
Maintenance of Mechanical Equipment	4.21	4.21
Compensation Payments to Employees Injured on Work	50.14	5,104.37
Medical and Surgical Services	5.00	1,241.55
Tools and Equipment	7.39	7.39
Sub Total Reforestation—Fire Stops and Fire Access Roads	$35,525.61	$119,387.19
Quabbin Reservoir Watershed—Fencing of Watershed Property:		
Labor	$110.51	$4,469.41
All Other Items	0.00	2,176.28
Sub Total Fencing of Watershed Property	$110.51	$6.645.69

	Year Ending June 30, 1947	Total to June 30, 1947
QUABBIN RESERVOIR WATERSHED—OTHER FORESTRY AND HURRICANE CLEARING:		
Total Except the Following Listed Items	$0.00	$6,552.75
Salaries, Engineering	7.73	2,776.76
Labor	1,551.00	43,754.28
Sub Total Forestry	$1,558.73	$53,083.79
QUABBIN RESERVOIR WATERSHED—PATROL EQUIPMENT:		
Purchase of Automobiles, Trucks, etc.	$2,705.27	$2,705.27
Maintenance of Boats	157.94	3,819.97
All Other Items	0.00	3,111.96
Sub Total Patrol Equipment	$2,863.21	$9,637.20
Total Quabbin Reservoir Watershed	40,598.84	439,755.55
Total Quabbin Reservoir, not Including Winsor Dam and Quabbin Dike (Except PWA)	$146,708.49	$19,308,478.81
TOTAL QUABBIN RESERVOIR, NOT INCLUDING WINSOR DAM AND QUABBIN DIKE	$146.708.49	$21,394,530.20

WINSOR DAM (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$2,712.93	$82,387.11
Engineering, Headquarters Office	4,706.73	241,177.42
Total General Overhead	$7,419.66	$323,564.53
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$93,591.42
Salaries, Engineering and Clerical	3,090.51	391,425.62
Labor	44.16	69,028.79
Medical and Surgical Services	13.00	210.00
Miscellaneous Expense (undistributed)	62.76	14,003.08
Printing and Blueprinting	13.20	2,617.12
Total Engineering	$3,223.63	$570,876.03
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts	$0.00	$4,858,626.77
Contract 149, Group A, Hydraulic Turbine	22,641.93	22,641.93
Contract 149, Group C, E. and F, Switchgear and Appurtenances	9,248.58	12,025.98
Contract 149, Group D, Transformers	0.00	3,095.28
Contract 150, Installation of above and Construction of Power Line at and Near Winsor Dam	24,171.21	28,928.61
Sub Total Construction Contracts	$56,061.72	$4,925,318.57
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Total Except the Following Listed Items	$0.00	$15,000.31
Miscellaneous Expense (undistributed)	1.20	13,707.73
Installed Equipment	335.00	46,339.21
Sub Total Except Construction Contracts	$336.20	$75,047.25
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—DEFENCE AGAINST ACTION FOR BREACH OF CONTRACT	$0.00	$58,471.50
Total Permanent Construction	56,397.92	5,058,837.32
Total Winsor Dam (Except PWA)	67,041.21	5,953,277.88

WINSOR DAM (PWA ONLY)

	$0.00	$61,261.84
TOTAL WINSOR DAM	$67,041.21	$6,014,539.72

QUABBIN DIKE

Total Expenditure	$0.00	$2,905,610.65

SPECIAL INVESTIGATIONS

Total Expenditure	$0.00	$149,609.63

SOUTHERN SUDBURY EMERGENCY SUPPLY

Total Expenditure	$0.00	$638,533.83

WACHUSETT WATERSHED PROTECTION AND ELIMINATION OF POLLUTION (EXCEPT PWA)

GENERAL OVERHEAD:		
Administration, Commissioners' Office	$15.15	$16,063.87
Engineering, Headquarters Office	26.27	43,805.02
Total General Overhead	$41.42	$59,868.89

	Year Ending June 30, 1947	Total to June 30, 1947
ENGINEERING:		
Total Except Salaries	$0.00	$18,231.17
Salaries, Engineering	291.51	18,097.64
Total Engineering	$291.51	$36,328.81
REAL ESTATE:		
Legal and Expert Expense	$77.74	$388.34
Purchases and Settlements	48,000.00	48,000.00
Taxes	0.00	785.06
Payments under Certificates of Judgment	0.00	18,234.91
Total Real Estate	$48,077.74	$67,408.31
TOWN OF HOLDEN SEWER (WPA PROJECT):	$0.00	$153,741.94
TOWN OF RUTLAND SEWER (WPA PROJECT):	$0.00	$136,058.34
WEST BOYLSTON SEWER:		
Total Except Rent and Upkeep	$0.00	$17,642.93
Rent and Upkeep	40.00	84.65
Total West Boylston Sewer	$40.00	$17,727.58
Total Wachusett Watershed Protection and Elimination of Pollution (Except PWA)	$48,450.67	$471,133.87
WACHUSETT WATERSHED PROTECTION (PWA ONLY)	$0.00	$450.95
TOTAL WACHUSETT WATERSHED PROTECTION	$48,450.67	$471,584.82
WESTON AQUEDUCT SIPHONS (PWA)		
Total Expenditure	$0.00	$336,169.80
HULTMAN AQUEDUCT SUPPLY SECTION (PWA)		
Total Except Real Estate	$0.00	$9,859,049.18
REAL ESTATE:		
Total Except Taxes	$0.00	$224,472.29
Taxes	2,517.19	17,004.71
Total Real Estate	$2,517.19	$241,477.00
Total Hultman Aqueduct, Supply Section (PWA)	$2,517.19	$10,100,526.18
HULTMAN AQUEDUCT SUPPLY SECTION (EXCEPT PWA)		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$573.42	$6,270.10
Engineering, Headquarters Office	994.85	17,134.63
Total General Overhead	$1,568.27	$23,404.73
ENGINEERING:		
Total Except the Following Listed Items	$—39.35	$1,147.28
Salaries, Engineering and Clerical	6,710.16	53,346.34
Labor	1,557.20	2,403.52
Miscellaneous Expense (undistributed)	3.74	24.94
Printing and Blueprinting	12.46	62.34
Stationery and Office Supplies	66.68	76.16
Automobile Purchase	1,530.00	1,530.00
Automobile Maintenance	130.06	291.75
Medical and Surgical Services	17.00	26.00
Total Engineering	$9,987.95	$58,908.33
PERMANENT CONSTRUCTION:	$0.00	$3,108.61
REAL ESTATE: Legal and Expert Expense	$93.83	$93,83
Total Hultman Aqueduct, Supply Section (Except PWA)	$11,650.05	$85,515.50
TOTAL HULTMAN AQUEDUCT, SUPPLY SECTION	$14,167.24	$10,186,041.68
HULTMAN AQUEDUCT, DISTRIBUTION SECTION (PWA)		
Total Except Real Estate	$0.00	$2,768,410.82
REAL ESTATE:		
Total Except Taxes	$0.00	$62,445.54
Taxes	1,346.20	8,234.75
Total Real Estate	$1,346.20	$70,680.29
Total Hultman Aqueduct Distribution Section (PWA)	$1,346.20	$2,839,091.11

HULTMAN AQUEDUCT, DISTRIBUTION SECTION (EXCEPT PWA)

	Year Ending June 30, 1947	Total to June 30, 1947
GENERAL OVERHEAD:		
Administration, Commissioners' Office	$16,453.86	$32,065.28
Engineering, Headquarters Office	28,546.25	74,456.00
Total General Overhead	$45,000.11	$106,521.28
ENGINEERING:		
Total Except the Following Listed Items	$0.00	$36,888.95
Salaries, Engineering and Clerical	47,536.04	196.094.02
Consultant Expense	311.72	1,335.05
Legal Expense	—2,587.72	2,679.39
Labor	4,583.20	7,646.00
Furniture and Fixtures	86.90	182.29
Engineering Instruments	944.39	972.72
Tools and Equipment	497.63	646.16
Rent and Upkeep	843.30	1,925.61
Automobile Purchase	913.40	913.40
Automobile Maintenance	1,290.53	3,567.47
Miscellaneous Expense (undistributed)	895.43	2,048.76
Printing and Blueprinting	162.53	575.09
Stationery and Office Supplies	340.55	841.72
Postage	70.00	189.44
Laboratory Supplies	10.66	123.63
Medical and Surgical Services	1.00	20.50
Medical and Surgical Supplies	250.87	304.56
Total Engineering	$56,150.43	$251,687.65
REAL ESTATE:		
Legal Expense	$3,957.55	$3,957.55
Printing and Blueprinting	33.28	33.28
Total Real Estate	$3,990.83	$3,990.83
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS		
Completed Contracts	$0.00	$606.90
Contract No. 117, Shafts 6 and 7 of City Tunnel Section of Hultman Aqueduct	300,020.08	300,020.08
Sub Total Construction Contracts	$300,020.08	$300,626.98
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Total Except Miscellaneous Expense	$0.00	$3,294.83
Miscellaneous Expense	94.37	94.37
Sub Total Except Construction Contracts	$94.37	$3,389.20
Total Permanent Construction	$300,114.45	$304,016.18
Total Hultman Aqueduct, Distribution Section (Except PWA)	$405,255.82	$666,215.94
TOTAL HULTMAN AQUEDUCT, DISTRIBUTION SECTION:	$406,602.02	$3,505,307.05

SPOT POND BY-PASS AND IMPROVEMENTS TO PUMPING STATION (PWA)

Total Expenditure	$0.00	$218,798.74

ENLARGING FELLS HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)

Total Expenditure	$0.00	$175,444.61

DEFERRED CHARGES TO MAINTENANCE—1946 DEFICIENCY

	$0.00	$5,340.67

SUMMARY

WATER SUPPLY CONSTRUCTION FUND

Total authorized under Chapter 111 and 375, Acts of 1926, Chapter 321, Acts of 1927 and Chapter 515, Acts of 1946		$75,900,000.00	
Amount reverted from authorization under said Chapter 111		261,466.17	$75,638,533.83
Received from City of Worcester under said Chapter 375	$1,000,000.00		
Income Credited to Construction Fund	1,098,952.78		
Serial Bonds issued and matured	22,365,000.00*		
Serial Bonds outstanding June 30, 1947	36,385,000.00		
Balance of Authorization available for issue	14,789,581.05		
	$75,638,533.83		
Contributions by Federal Government from PWA Funds		$0.00	$7,073,003.78
Total Construction Fund			$82,711,537.61

*Not Including Maturities of July 1, 1947 amounting to $1,097,000.00.

EXPENDITURES	Year Ending June 30, 1947	Total to June 30, 1947
Southern Sudbury Emergency Supply	$0.00	$638,533.83
Ware and Swift Supply (Including Portion under PWA):		
Ware Supply, including Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct	$65,587.20	$15,313,079.44
Coldbrook-Swift Tunnel Section of Quabbin Aqueduct	0.00	5,422,684.86
Quabbin Reservoir	146,708.49	21,394,530.20
Winsor Dam	67,041.21	6,014,539.72
Quabbin Dike	0.00	2,905,610.65
Special Investigations	$0.00	$149,609.63
Wachusett Watershed Protection and Elimination of Pollution (Including both PWA and WPA Projects)	$48,450.67	$471,584.82
Hultman Aqueduct and Other Works (Including Portion Under PWA):		
Weston Aqueduct Siphons	$0.00	$336,169.80
Hultman Aqueduct, Supply Section	14,167.24	10,186,041.68
Hultman Aqueduct, Distribution Section	406,602.02	3,505,307.05
Spot Pond By-Pass and Improvements to Pumping Station	0.00	218,798.74
Enlarging Fells High-Level Distributing Reservoir	0.00	175,444.61
Deferred Charges to Maintenance—1946 Deficiency	0.00	5,340.67
Total Expenditures	$748,556.83	$66,737,275.70

RECEIPTS

Receipts from Sales	$2,893.20	$496,444.40
Receipts from Rents	3,256.77	475,746.97
All Other Receipts	110.30	154,420.32
Total Receipts, Construction Fund	$6.260.27	$1,126,611.69

DISTRIBUTION OF RECEIPTS

Credited to Annual Water Assessments as Follows:			
To 1928 Assessment, Rents and Sales	$3,033.03		
To 1929 Assessment, Rents and Sales	24,343.77		
To Assessments 1927 to Date, Interest	282.11	$0.00	$27,658.91
Credited to Construction Fund		6,260.27	1,098,952.78
Total Receipts, Construction Accounts		$6,260.27	$1,126,611.69

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR BY THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION FROM MAINTENANCE FUNDS

General Overhead:	
Administration, Commissioner's Office—Clerical Salaries	$5,464.95
Engineering, Headquarters Office—Clerical Salaries	793.34
Total General Overhead	$6,258.29

Ware Supply and Quabbin Aqueduct

Maintenance and Operation of Water Supply Works:	
Salaries, Engineering and Clerical	$7,506.03
Labor	12,941.38
Supplies	386.24
Automobile Maintenance	1,024.19
Installed Equipment	30.52
Engineering Instruments	5.94
Tools and Other Mechanical Equipment	157.99
Rent and Upkeep	1,903.96
Miscellaneous Expense (undistributed)	72.22
Printing and Blueprinting	17.64
Stationery and Office Supplies	57.58
Postage	13.70
Medical and Surgical Supplies	10.00
Medical and Surgical Services	12.50
Sub Total Maintenance and Operation of Water Supply Works	$24,139.89

	Year Ending June 30, 1947	Total to June 30, 1947
MAINTENANCE OF WATERSHED:		
Salaries, Engineering and Clerical		$5,911.24
Labor		16,370.71
Automobile Maintenance		1,311.68
Tools and Other Mechanical Equipment		140.13
Rent and Upkeep		15.50
Miscellaneous Expense (undistributed)		11.00
Printing and Blueprinting		10.60
Stationery and Office Supplies		26.36
Postage		13.60
Medical and Surgical Services		43.25
Medical and Surgical Supplies		18.43
Sub Total Maintenance of Watershed		$23,872.50
GUARDING AND FIRE PROTECTION:		
Police Protection—Labor		$198.00
Fire Protection—Labor		22.10
Automobile Maintenance		2.47
Supplies		107.10
Sub Total Guarding and Fire Protection		$329.67
MAINTENANCE AND OPERATION OF RUTLAND-HOLDEN SEWER:		
Salaries, Engineering		$56.43
Labor		1,052.68
Use of City of Worcester Sewerage System		962.05
Sub Total Maintenance of Rutland-Holden Sewer		$2,071.16
Total Ware Supply and Quabbin Aqueduct		$50,413.22

QUABBIN RESERVOIR

	Year Ending June 30, 1947	Total to June 30, 1947
MAINTENANCE AND OPERATION OF WATER SUPPLY WORKS:		
Salaries, Engineering and Clerical		$20,647.87
Labor		22,939,27
Supplies		1,376.54
Automobile Maintenance		1,748.27
Installed Equipment		343.16
Tools and Other Mechanical Equipment		382.79
Rent and Upkeep		6,332.09
Miscellaneous Expense (undistributed)		273.51
Printing and Blueprinting		18.80
Stationery and Office Supplies		120.59
Postage		22.70
Medical and Surgical Services		8.00
Medical and Surgical Supplies		8.28
Sub Total Maintenance and Operation of Water Supply Works		$54,221.87
MAINTENANCE OF RESERVOIR AND WATERSHED:		
Salaries, Engineering and Clerical		$4,488.66
Labor		22,667.67
Supplies		66.33
Automobile Maintenance		2,191.49
Boats and Other Floating Equipment		153.97
Tools and Other Mechanical Equipment		311.47
Miscellaneous Expense (undistributed)		317.13
Printing and Blueprinting		5.63
Stationery and Office Supplies		24.97
Postage		12.50
Medical and Surgical Services		20.00
Medical and Surgical Supplies		21.27
Sub Total Maintenance of Reservoir and Watershed		$30,281.09
GUARDING AND FIRE PROTECTION:		
Police Protection:		
Labor		$299.21
Automobile Maintenance		–460.72
Fire Protection:		
Salaries, Engineering and Clerical		71.45
Labor		520.23
Fire Equipment		372.16
Automobile Maintenance		12.03
Rent and Upkeep		28.30
Miscellaneous Expense (undistributed)		42.94
Sub Total Guarding and Fire Protection		$885.60

MAINTENANCE AND OPERATION OF QUABBIN PARK CEMETERY:	Year Ending June 30, 1947	Total to June 30, 1947
Salaries, Engineering and Clerical		$3,093.34
Labor		11,363.58
Supplies		509.34
Automobile Maintenance		99.10
Tools and Other Mechanical Equipment		468.15
Rent and Upkeep		62.23
Sub Total Maintenance of Quabbin Park Cemetery		$15,595.74
Total Maintenance—Quabbin Reservoir		$100,984.30

HULTMAN AQUEDUCT—SUPPLY SECTION

Salaries, Engineering and Clerical	$9,922.56
Labor	9,771.60
Supplies	43.29
Automobile Maintenance	568.88
Tools and Other Mechanical Equipment	165.16
Miscellaneous Expense (undistributed)	8.45
Printing and Blueprinting	11.00
Stationery and Office Supplies	9.41
Rent and Upkeep	330.63
Medical and Surgical Supplies	3.68
Total Maintenance of Hultman Aqueduct, Supply Section	$20,834.66

HULTMAN AQUEDUCT—DISTRIBUTION SECTION

Salaries, Engineering and Clerical	$13,497.54
Labor	27,695.35
Supplies	382.69
Automobile Maintenance	1,007.18
Tools and Other Mechanical Equipment	424.67
Installed Equipment	58.36
Engineering Instruments	15.49
Rent and Upkeep	2,409.07
Miscellaneous Expense (undistributed)	297.87
Stationery and Office Supplies	69.25
Postage	6.00
Medical and Surgical Services	62.50
Total Maintenance of Hultman Aqueduct, Districtuion Section	$45,925.97

SUMMARY

WATER SUPPLY MAINTENANCE FUNDS

EXPENDITURES

GENERAL OVERHEAD	$6,258.29
WARE SUPPLY AND, QUABBIN AQUEDUCT	50,413.22
QUABBIN RESERVOIR	100,984.30
HULTMAN AQUEDUCT, SUPPLY SECTION	20,834.66
HULTMAN AQUEDUCT, DISTRIBUTION SECTION	45,925.97
1946 Liabilities	327.09
1947 Liabilities	934.59
Total Expenditures	$225,678.12

RECEIPTS

Receipts from Rents	$1,630.00
Quabbin Park Cemetery:	
Receipts from Sale of Lots	70.00
Interment and Foundation Fees, etc.	372.20
Miscellaneous (reimbursements for Sewage Disposal)	1,193.65
Total Cash Receipts	$3,265.85

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION AS ENLARGED BY CHAPTER 705 OF THE ACTS OF 1945 EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND TOTAL TO DATE ON ACCOUNT OF METROPOLITAN SEWAGE DISPOSAL

Sewage Disposal Fund

Total Appropriated under Chapter 512, Acts of 1939, Chapter 720, Acts of 1941, Chapter 705, Acts of 1945, and Chapter 446, Acts of 1946, from Total of $15,000,000.00 authorized		$6,289,907.23
Serial Bonds issued and matured	$119,000.00	
Serial Bonds outstanding June 30, 1947	1,481,000.00	
Balance of Appropriation available for Issue	4,506,167.96	
	$6,106,167.96	
Expenditures by Metropolitan District Commission (1940-1941)		
Contract for Borings	$36,291.61	
Preliminary Report of Consulting Engineers	147,303.81	
Miscellaneous	143.85	183,739.27
Net Sewage Disposal Fund Available		$6,106,157.96

EXPENDITURES

Nut Island Sewage Treatment Plant

	Year Ending June 30, 1947	Total to June 30, 1947
General Overhead:		
Administration, Commissioners' Office	$21,294.67	$36,203.73
Engineering, Headquarters Office	132,651.26	350,933.53
Total General Overhead	$153,945.93	$387,137.26
Engineering (Field):		
Salaries, Engineering and Clerical	$83,640.15	$194,305.24
Consultant Expense	276.43	698.39
Legal Expense	0.00	1,355.40
Labor	7,404.20	14,835.25
Engineering Instruments	277.28	716.41
Tools and Equipment	27.39	155.07
Laboratory Equipment	490,58	1,637.27
Furniture and Fixtures	13.43	112.14
Rent and Upkeep	1,170.58	1,734.73
Automobile Maintenance	1,236.67	3,810.89
Maintenance of Mechanical Equipment	45.01	115.84
Rental of Equipment	0.00	150.00
Maintenance of Boats	36.10	36.10
Installed Equipment	4,173.34	4,173.34
Boats, Seaplanes, etc.	4.76	4.76
Diver—Sludge Disposal Line	549.00	549.00
Miscellaneous Expense (undistributed)	932.90	2,197.38
Printing and Blueprinting	1,100.57	1,798.23
Stationery and Office Supplies	382.48	679.45
Postage	20.46	81.14
Laboratory Supplies	238.40	653.95
Medical and Surgical Services	59.50	283.32
Medical and Surgical Supplies	24.65	67.11
Compensation to Labor for Injuries	0.00	71.36
Total Engineering	$102,103.88	$230,221.77
Real Estate:		
Legal Expense	$570.32	$1,272.87
Purchase of Real Estate	1,300.00	1,300.00
Total Real Estate	$1,870.32	$2,572.87
Permanent Construction—Construction Contracts:		
Contract No. 136, Earthwork Excavation and Fill at and near Nut Island, Quincy	$132,784.16	$408,865.24
Contract No. 137, Construction of Main Bldg., Substructure, Sedimentation Tanks, etc.	319,801.48	319,801.48
Contract No. 138, Soundings for Location of Sludge Disposal Line Nut Island, Quincy	0.00	15,488.95
Contract No. 139, Constructing 12" Sludge Line	165,452.96	165,452.96
Contract No. 144 A & B, Cranes and Hoists	4,613.71	4,613.71
Contract No. 147, Resurfacing Sea and Island Avenues, Quincy	16,456.67	16,456.67
Sub Total Construction Contracts	$639,108.98	$930,679.01

Permanent Construction—Except Construction Contracts:	Year Ending June 30, 1947	Total to June 30, 1947
Miscellaneous Expense (undistributed)	$477.54	$477.54
Sub Total Except Construction Contracts	$477.54	$477.54
Total Permanent Construction	$639,586.52	$931,156.55
Total Nut Island Sewage Treatment Plant	$897,506.65	$1,551,088.45

Charles River Basin, Storm Overflow Sewer, South Side

General Overhead:		
Engineering, Headquarters Office	$809.89	$4,772.57
Engineering (Field):		
Salaries, Engineering and Clerical	$144.09	$1,681.32
Labor	36.55	36.55
Miscellaneous Expense	5.49	5.49
Total Engineering	$186.13	$1,723.36
Total Charles River Basin, Storm Overflow Sewer, South Side	$996.02	$6,495.93

Charles River Basin, Storm Overflow Sewer, North Side

General Overhead		
Engineering, Headquarters Office	$66.51	$2,217.42
Engineering (Field):		
Salaries, Engineering and Clerical	$537.52	$1,900.22
Installed Equipment	39.75	39.75
Total Engineering	$577.27	$1,939.97
Total Charles River Basin, Storm Overflow Sewer, North Side	$643.78	$4,157.39

Alewife Brook Storm Overflow Sewer

General Overhead:		
Engineering, Headquarters Office	$9,596.08	$11,189.40
Engineering (Field):		
Salaries, Engineering and Clerical	$32,866.39	$36,089.41
Labor	5,052.40	5,263.00
Automobile Maintenance	606.94	633.87
Medical and Surgical Services	10.00	10.00
Miscellaneous Expense	5.65	5.65
Total Engineering	$38,541.38	$42,001.93
Total Alewife Brook Storm Overflow Sewer	$48,137.46	$53,191.33

North Metropolitan Relief Sewer

General Overhead:		
Engineering, Headquarters Office	$553.77	$553.77

Deer Island Sewage Treatment

General Overhead:		
Engineering, Headquarters Office	$308.15	$308.15

SUMMARY

Nut Island Sewage Treatment Plant	$897,506.65	$1,551,088.45
Charles River Basin, Storm Overflow Sewer, South Side	$996.02	$6,495.93
Charles River Basin, Storm Overflow Sewer, North Side	$643.78	$4,157.39
Alewife Brook Storm Overflow Sewer	$48,137.46	$53,191.33
North Metropolitan Relief Sewer	$553.77	$553.77
Deer Island Sewage Treatment	$308.15	$308.15
Total Expenditures	$948,145.83	$1,615,795.02

The principal financial items of this report are in agreement with the Comptroller's Books.
Date: February 4, 1948
Checked by: Joseph A. Prenney.

Ralph E. Houghton,
Acting Comptroller.

CANVASS OF BIDS FOR CONTRACTS 117A AND 117B —— OPENED OCT. 30, 1946

COMMONWEALTH OF MASSACHUSETTS
METR DISTR. WATER SUPPLY COMMISSION
(AS ENLARGED)

CONTRACTS 117A AND 117B

FOR THE CONSTRUCTION OF SHAFTS 6 AND 7 OF THE CITY TUNNEL
IN THE CITIES OF NEWTON AND BOSTON MASSACHUSETTS

Item No.	Description	Unit	① Marinucci Bros & Co 51 Ceylon St Dorchester, Mass			② 8 Perini & Sons, Inc. CJ Maney Co, Inc Rugo Const Co, Inc Framingham, Mass.			③ Drava Corp. 300 Penn. Ave. Pittsburgh, Pa		
			Alternate C			Alternate C			Alternate C		
			Quan	Price	Amount	Quan	Price	Amount	Quan	Price	Amount
1	Earth excavation Shaft 6	Cu. Yd	200	15.00	3,000	200	3 60	720	200	25 00	5,000.
2	Earth excavation Shaft 7	Cu. Yd	50	20.00	1,000	50	3 60	180	50	5.00	250.
3	Rock excavation Shaft 6 and within 50 feet of shaft center line	Cu Yd	3,300	34 00	112,200.	3,300	31 50	103,950.	3,300	25.00	82,500
4	Rock excavation Shaft 7 and within 50 feet of shaft center line	Cu. Yd.	4,700	30 00	141,000	4,700	29 00	136,300	4,700	22.00	103,400
5	Rock excavation in tunnel from Shaft 6, except within 50 feet of shaft center line	Cu. Yd.	2,200	23.00	50,600	2,200	25 50	56,100	2,200	32.00	70,400
6	Rock excavation in tunnel from Shaft 7, except within 50 feet of shaft center line	Cu. Yd	3,400	23.00	78,200	3.400	25.50	86,700.	3,400	28.00	95,200
7	Enlargement of shafts and tunnel	Cu. Yd	200	40 00	8,000.	200	23 50	4,700	200	20.00	4,000
8	Drainage channels for shafts and tunnel.	Lin Ft	1,650	2 00	3,300	1,650	4 50	7,425	1,650	35.00	57,150
9	Pumping from Shaft 6	Mil Ft Gal	5,000	1 50	7,500	5,000	20	1,000	5,000	25	1,250
10	Pumping from Shaft 7	Mil Ft Gal	10,000	1 50	15,000	10,000	20	2.000	10,000	25	2,500
11	Forms for concrete lining. Shaft 6	Lin Ft	280	25.00	7,000	280	75 00	21,000.	280	190.00	53,200.
12	Forms for concrete lining Shaft 7	Lin. Ft	230	30.00	6,900	230	120 00	27,600	230	205 00	47,150.
13	Concrete masonry, Shaft 6	Cu. Yd	900	20.00	18,000	900	17 25	15,525	900	35 00	31,500
14	Concrete masonry, Shaft 7	Cu. Yd.	1,000	20.00	20,000	1,000	17 25	17,250	1,000	35.00	35.000
15	Excess concrete masonry, fixed sum of five dollars $5.00	Cu. Yd	100	5.00	500	100	5 00	500	100	5 00	500
16	Portland cement	Bbl	3.800	3 10	11,780	3,800	3.20	12,160	3,800	3 50	13,300.
17	Reinforcing steel.	Pound	4,000	10	400	4,000	08	320.	4,000	09	360
18	Structural steel support and metal piping	Pound	23,000	20	4,600.	23,000	25	5.750	23,000	20	4,600
19	Timbering in shafts and tunnel	M.B.M	10	250 00	2,500	10	300 00	3,000	10	285.00	2.850
20	Dry packing	Cu. Yd.	100	10 00	1,000	100	11 00	1,100	100	10.00	1,000
21	Drilling holes in rock or masonry	Lin Ft	200	2 00	400	200	1 20	240.	200	1 00	200
22	Steel pipe for grouting	Lin. Ft.	500	1 50	750	500	90	450	500	2.00	1,000
23	Sand for grout and for protective covering of cement mortar	Cu. Yd	100	3 50	350	100	4 00	400	100	5.00	500
24	Mixing and placing grout	Cu. Yd.	140	20 00	2,800	140	23 50	3,290	140	50.00	7,000.
25	Protective coating of cement mortar	Cu. Yd.	20	15 00	300	20	18 00	360	20	20.00	400
26	Miscellaneous lumber	M.B.M	5	200 00	1,000	5	300 00	1.500	5	270 00	1,350
27	Fencing	Lin. Ft.	1,900	2 25	4,275	1,900	2 60	4,940.	1,900	2.75	5,225
28	Locker house at Shaft 6	Lump S		5,000 00	5,000.		17,500 00	17,500		6,000 00	6,000
29	Locker house at Shaft 7	Lump S		5,000 00	5,000		20000.00	20,000		6,000.00	6,000
30	Cleaning up.	Lump S		5,000 00	5,000.		3,200 00	3,200		4,500 00	4,500
	Sub totals (items 1 to 30 inc)				517,355 00			555,160 00			643,885 00
31	Furnishing performance bond			10 00	5,173 55		10 00	5,551.60		10.00	6,438 85
	Totals				522,528 55			560,711 60			650,323.85
	Bid Security BB INDICATES BID BOND CC INDICATES CERTIFIED CHECK		BB		26.126.43	BB		28.035 58	C.C.		35,000 00

Item No.	Description	Unit	④ Morrison - Knudson Co Inc. 319 Broadway Boise, Idaho			⑤ V Barletta Co 10 Whipple Ave Roslindale, Mass & Cabot Construction Corp 595 Madison Ave. New York City N Y			⑥ Stiers Bros Const Co 2944 Magazine St St Louis, Mo.		
			Alternate C			Alternate C			Alternate C		
			Quan	Price	Amount	Quan	Price	Amount	Quan	Price	Amount
1	Earth excavation Shaft 6	Cu. Yd	200	24 60	4,920	200	25 00	5,000.	200	25.00	5,000
2	Earth excavation Shaft 7	Cu. Yd	50	16 80	840	50	25.00	1,250	50	25 00	1,250.
3	Rock excavation Shaft 6 and within 50 feet of shaft center line	Cu Yd	3,300	46 50	153,450.	3,300	42.00	138,600	3,300	50 00	165,000
4	Rock excavation Shaft 7 and within 50 feet of shaft center line	Cu. Yd.	4,700	39.40	185,180.	4,700	44 00	206,800	4,700	48 00	225,600
5	Rock excavation in tunnel from Shaft 6, except within 50 feet of shaft center line	Cu. Yd.	2,200	30.60	67,320	2,200	33 00	72,600.	2,200	40.00	88,000.
6	Rock excavation in tunnel from Shaft 7, except within 50 feet of shaft center line	Cu. Yd	3 400	28.10	95,540	3,400	36 00	122,400.	3,400	39 00	132,600
7	Enlargement of shafts and tunnel	Cu. Yd	200	39 30	7,860	200	60 00	12,000	200	20.00	4,000
8	Drainage channels for shafts and tunnel.	Lin Ft	1,650	3.92	6,468	1,650	15.00	24,750.	1,650	20 00	33,000
9	Pumping from Shaft 6	Mil Ft Gal	5,000	2 80	14,000	5,000	1 50	7,500	5,000	20	1,000.
10	Pumping from Shaft 7	Mil Ft Gal	10,000	2.80	28,000	10.000	1.50	15,000.	10,000	1 00	10,000
11	Forms for concrete lining. Shaft 6	Lin Ft	280	39 20	10,976	** 260	60.00	15,600.	280	40 00	11,200.
12	Forms for concrete lining Shaft 7	Lin. Ft	230	72 80	16,744	230	60.00	13 800	230	50.00	11,500.
13	Concrete masonry, Shaft 6	Cu. Yd	900	48 40	43,560	900	35 00	31,500.	900	20.00	18,000
14	Concrete masonry, Shaft 7	Cu. Yd.	1,000	48.10	48,100.	1,000	40 00	40,000.	1,000	20.00	20,000
15	Excess concrete masonry, fixed sum of five dollars $5.00	Cu. Yd	100	5 00	500	100	5 00	500	100	5 00	500
16	Portland cement	Bbl	3,800	3.64	13,832	3,800	4.00	15,200	3,800	5 00	19,000
17	Reinforcing steel.	Pound	4,000	134	536	4,000	25	1,000	4.000	10	400
18	Structural steel support and metal piping	Pound	23,000	168	3,864	23,000	30	6,900.	23,000	20	4,600.
19	Timbering in shafts and tunnel	M.B.M	10	224.00	2,240	10	500.00	5,000	10	300.00	3,000.
20	Dry packing	Cu. Yd.	100	16 80	1,680	100	20.00	2,000	100	12.00	1,200.
21	Drilling holes in rock or masonry	Lin Ft	200	1 40	280.	200	3 00	600	200	1 50	300
22	Steel pipe for grouting	Lin. Ft.	500	1 68	840.	500	6.00	3.000.	500	2 50	1,250
23	Sand for grout and for protective covering of cement mortar	Cu. Yd	100	5 60	560	100	4 00	400.	100	3.00	300
24	Mixing and placing grout	Cu. Yd.	140	39 20	5,488	140	25.00	3,500	140	50 00	7,000
25	Protective coating of cement mortar	Cu. Yd.	20	56.00	1,120.	20	50.00	1,000.	20	60.00	1,200
26	Miscellaneous lumber	M.B.M	5	168 00	840.	5	400.00	2,000	5	250 00	1,250
27	Fencing	Lin. Ft.	1,900	3 36	6,384	1,900	3 00	5,700	1,900	4 00	7,600
28	Locker house at Shaft 6	Lump S		3920 00	3,920		6.000.00	6,000		5,000.00	5,000
29	Locker house at Shaft 7	Lump S		3,920.00	3,920.		6,000.00	6.000		5,000.00	5,000.
30	Cleaning up.	Lump S		5,600.00	5,600		5,000.00	5,000		15,000.00	15,000.
	Sub totals (items 1 to 30 inc)				734,562 00			770,600 00			798,750 00
31	Furnishing performance bond			14 7804	10,857 12		10 00	7,706 00		15 00	11,981 25
	Totals				745,419.12			778,306 00			810,731.25
	Bid Security BB INDICATES BID BOND CC INDICATES CERTIFIED CHECK		B.B		37,500.00	B.B.		60.000 00	B.B		40.536.56

Item No.	Description	Unit	⑦ * C&R Construction Co 75 Bradeen St Roslindale, Mass			⑧ Drava Corp 300 Penn. Ave. Pittsburgh, Pa			⑨ Drava Corp 300 Penn Ave. Pittsburg, Pa		
			Alternate A			Alternate A			Alternate B		
			Quan	Price	Amount	Quan	Price	Amount	Quan	Price	Amount
1	Earth excavation Shaft 6	Cu. Yd	200	50 00	10,000	200	25.00	5,000			
2	Earth excavation Shaft 7	Cu. Yd							50	5 00	250
3	Rock excavation Shaft 6 and within 50 feet of shaft center line	Cu Yd	3,300	33 50	110,550.	3,300	25.00	82,500			
4	Rock excavation Shaft 7 and within 50 feet of shaft center line	Cu. Yd.							4,700	22 00	103,400
5	Rock excavation in tunnel from Shaft 6, except within 50 feet of shaft center line	Cu. Yd.	2,200	33.50	73,700	2,200	32 00	70,400			
6	Rock excavation in tunnel from Shaft 7, except within 50 feet of shaft center line	Cu. Yd							3,400	28 00	35,200.
7	Enlargement of shafts and tunnel	Cu. Yd	100	33 50	3.350.	100	20 00	2,000.	100	20.00	2,000
8	Drainage channels for shafts and tunnel.	Lin Ft	700	5.00	3,500.	700	35 00	24,500	950	35.00	33 250
9	Pumping from Shaft 6	Mil Ft Gal	5,000	1 50	7,500	5,000	25	1,250			
10	Pumping from Shaft 7	Mil Ft Gal							10,000	25	2,500
11	Forms for concrete lining. Shaft 6	Lin Ft	280	38 00	10,640	280	190.00	53,200			
12	Forms for concrete lining Shaft 7	Lin. Ft							230	205 00	47,150.
13	Concrete masonry, Shaft 6	Cu. Yd	900	21 00	18,900	900	35 00	31,500			
14	Concrete masonry, Shaft 7	Cu. Yd.							1,000	35.00	35,000.
15	Excess concrete masonry, fixed sum of five dollars $5.00	Cu. Yd	50	5 00	250	50	5 00	250	50	5.00	250.
16	Portland cement	Bbl	1,800	4 00	7,200	1,800	3 50	6,300	2,000	3 50	7,000.
17	Reinforcing steel.	Pound	2.000	25	500	2,000	.09	180	2,000	09	180.
18	Structural steel support and metal piping	Pound	14,000	40	5,600.	14,000	20	2,800	9,000	20	1,800.
19	Timbering in shafts and tunnel	M.B.M	4	400 00	1,600.	4	285 00	1,140	6	285 00	1,710.
20	Dry packing	Cu. Yd.	40	40 00	1,600	40	10.00	400	60	10 00	600.
21	Drilling holes in rock or masonry	Lin Ft	100	2.00	200	100	1 00	100	100	1.00	100.
22	Steel pipe for grouting	Lin. Ft.	250	3 00	750	250	2.00	500	250	2 00	500.
23	Sand for grout and for protective covering of cement mortar	Cu. Yd	50	5.00	250.	50	5 00	250	50	5.00	250.
24	Mixing and placing grout	Cu. Yd.	60	100.00	6.000	60	50 00	3,000	80	50 00	4,000.
25	Protective coating of cement mortar	Cu. Yd.	10	200 00	2,000	10	20 00	200	10	20.00	200.
26	Miscellaneous lumber	M.B.M	2	400 00	800.	2	270.00	540	3	270 00	810.
27	Fencing	Lin. Ft.	900	2 75	2,475.	900	2.50	2,250.	1,000	3 00	3,000.
28	Locker house at Shaft 6	Lump S		5,000 00	5,000		6,000 00	6,000			
29	Locker house at Shaft 7	Lump S								6,000 00	6,000.
30	Cleaning up.	Lump S		5,000 00	5,000.		2,000 00	2,000		2,500.00	2,500
	Sub totals (items 1 to 30 inc)				277,365 00			296,260 00			347,650.00
31	Furnishing performance bond			15.00	4,160.47		10.00	2,962 60		10 00	3476.50
	Totals				281,525.47			299,222 60			351,126 50
	Bid Security BB INDICATES BID BOND CC INDICATES CERTIFIED CHECK		BB		14,076.27	C.C	(See alt C)		C C	(See alt C)	

Contract awarded Nov. 6, 1946
Contract executed Nov 25, 1946

Tabulated by LEP
Checked by JRS

Alternate A is for Shaft 6 only
Alternate B is for Shaft 7 only
Alternate C is for Shaft 6 and Shaft 7

** Should be 280

* An informal bid on alternate B of cost plus 20 % and on alternate C of cost plus 20 % was also submitted.

File Cont 117 333X

Acc 50.576

CANVASS OF BIDS FOR CONTRACT 139 — OPENED OCT 16, 1946

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
AS ENLARGED

CONTRACT 139

FOR CONSTRUCTING A 12-INCH SLUDGE DISPOSAL LINE FROM NUT ISLAND TO PRESIDENT ROADS IN THE TOWN OF HULL AND THE CITIES OF QUINCY AND BOSTON, AND OUTFALL DIFFUSERS IN THE TOWN OF HULL, MASSACHUSETTS.

ITEM NO	DESCRIPTION	UNIT	QUANTITY	★ ① Bay State Dredging and Contracting Co. 62 Condor St E. Boston, Mass.		② George M. Bryne 294 Washington St. Boston, Mass.		③ Merritt-Chapman & Scott Corp. 292 Pequot Ave New London, Conn.		④ V Barletta Co. 10 Whipple Ave Roslindale, Mass.	
				PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
1	Earth excavation above El. 100.	Cu. Yd	9,000	5.50	49,500	4.00	36,000	8.00	72,000	2.00	18,000
2	Earth excavation between El 80+100	Cu. Yd	3,800	6.45	24,510	9.00	34,200	3.15	11,970	2.00	7,600
3	Earth excavation below El. 80.	Cu. Yd.	10,000	5.15	51,500	9.00	90,000	5.80	58,000	2.00	20,000
4	Rock excavation above El. 100.	Cu. Yd	600	20.00	12,000	15.00	9,000	10.00	6,000	15.00	9,000
5	Rock excavation between El 80+100	Cu. Yd.	200	30.00	6,000	25.00	5,000	45.00	9,000	30.00	6,000
6	Rock excavation below El. 80.	Cu. Yd.	400	10.00	4,000	35.00	14,000	52.00	20,800	50.00	20,000
7	Refill and embankment above El. 100.	Cu. Yd	9,000	.50	4,500	2.00	18,000	2.50	22,500	.75	1,750
8	Refill and embankment between El 80+100	Cu. Yd	3,800	2.50	9,500	2.00	7,600	3.15	11,970	.75	2,850
9	Refill below El. 80.	Cu. Yd.	10,000	2.37	23,700	2.00	20,000	3.15	31,500	.75	7,500
10	Preparing trench bottom	Lin Ft	21,000	1.00	21,000	1.00	21,000	1.72	36,120	1.00	21,000
11	Crushed stone and screened gravel	Cu. Yd.	300	10.00	3,000	7.00	2,100	8.00	2,400	10.00	3,000
12	Riprap.	Cu. Yd	450	8.00	3,600	15.00	6,750	12.00	5,400	10.00	4,500
13	Furnishing and laying cast iron pipe and fittings above El. 100	Lin. Ft	7,500	17.50	131,250	7.50	56,250	15.00	112,500	25.00	187,500
14	Furnishing and laying cast iron pipe and fittings below El. 100.	Lin Ft	13,800	8.80	121,440	19.00	262,200	17.00	234,600	45.00	621,000
15	Creosoted timber piles.	Lin. Ft	2,500	3.00	7,500	3.00	7,500	4.00	10,000	7.00	17,500
16	Creosoted timber sills, caps and bracing	M.B.M	10	696.00	6,960	300.00	3,000	1,100.00	11,000	600.00	6,000
17	Miscellaneous lumber.	M.B.M.	10	400.00	4,000	300.00	3,000	400.00	4,000	400.00	4,000
18	Reinforced concrete.	Cu. Yd.	140	80.00	11,200	100.00	14,000	80.00	11,200	60.00	8,400
19	Miscellaneous plain concrete.	Cu. Yd.	120	75.00	9,000	100.00	12,000	80.00	9,600	55.00	6,600
20	Reinforcing steel.	Pound	15,000	.20	3,000	.15	2,250	.13	1,950	.20	3,000
21	Portland cement.	Bbl.	400	6.00	2,400	6.00	2,400	4.00	1,600	5.00	2,000
22	Miscellaneous steel and iron.	Pound	2,500	1.00	2,500	1.00	2,500	.22	550	1.00	2,500
23	Furnishing and setting gate valves and air valves.	Lump S.			4,000		3,500		4,334		2,500
24	Construction of air valves and access chambers in addition to other items.	Lump S.			11,000		2,500		2,000		1,500
25	Caring for and relaying existing sewer, water and cable lines plus other items.	Lump S.			6,400		3,000		6,000		2,000
26	Furnishing and placing special outlet at President Roads.	Lump S.			7,000		19,000		3,720		6,000
27	Furnishing and placing outfall diffusers	Lump S.			28,000		35,000		15,000		35,000
28	Cleaning up.	Lump S.			1,000		2,500		6,000		2,500
	Sub-Totals (Items 1 to 28 incl.)				569,460		694,250		721,714		1,034,200
29	Furnishing Performance Bond.				6,264.06		6,942.50		10,825.71		10,342.00
	Totals				575,724.06		701,192.50		732,539.71		1,044,542.00
	Bid Security BB INDICATES BID BOND CC INDICATES CERTIFIED CHECK			B.B. 30,000.00		B.B. 40,000.00		C.C. 50,000.00		B.B. 75,000.00	

★Contract awarded Oct. 16, 1946 — Tabulated by JJD

Contract executed Nov. 4, 1946 — Checked by KRS

FILE CONT. 139 - 5 24N-1

Acc. 50,894

CANVASS OF BIDS FOR CONTRACT 146 — OPENED APRIL 29, 1947

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR WATER SUPPLY COMMISSION
(AS ENLARGED)
CONTRACT NO. 146
FOR THE CONSTRUCTION OF THE CONCRETE PORTION OF THE SLUDGE DIGESTION TANKS OF THE NUT ISLAND SEWAGE TREATMENT PLANT AT NUT ISLAND IN THE CITY OF QUINCY MASSACHUSETTS

Item No	Description	Unit	Quanities Alternative A	Quanities Alternative B	★ ① Farina Bros 61 Bridge St Newton Mass Alternative A Price	Amount	② Farina Bros. 61 Bridge St Newton, Mass Alternative B Price	Amount	③ Coleman Bros Corp 40 Central St Boston, Mass Alternative A Price	Amount	④ Berke Moore Co Inc 8 Newbury St Boston Mass Alternative B Price	Amount
1	Excavation	Cu Yd	3500	2,500	400	14,000	400	10,000	150	5250	500	12,500
2	Refill and embankment	Cu Yd	3500	2,500	200	7,000	200	5,000	100	3500	100	2500
3	Crushed stone and screened gravel	Cu Yd	200	200	500	1000	500	1,000	500	1,000	400	800
4	Concrete in foundations and floors	Cu Yd	2,200	1,700	3175	69850	4500	76,500	1800	39,600	2500	42500
5	Concrete in sidewalls	Cu Yd	3200	1,500	3175	101,600	4500	67,500	3950	126,400	6900	103,500
6	Concrete not included in Items 4 & 5	Cu Yd.	600	600	3175	19,050	4500	27,000	7000	42,000	6000	36,000
7	Portland Cement	Barrel	10,000	6,500	330	33,000	330	21,450	330	33,000	350	22750
8	Reinforcing steel	Pound	1500,000	500,000	008	120,000	008	40,000	008	120000	007	35,000
9	Prestressing and gunite work	Each Tank	—	4	—	—	3000000	120,000	—	—	2875000	115000
10	Rubbed finish	Sq Ft	16,000	—	0125	2,000	—	—	020	3,200	—	—
11	Cast iron pipe specials	Pound	20,000	17,000	022	4,400	025	4,250	025	5,000	040	6800
12	Miscellaneous iron and steel	Pound	50,000	50,000	020	10,000	027	13,500	035	17,500	045	22,500
13	Miscellaneous non-ferrous metals	Pound	2,000	2,000	0225	450	130	2,600	150	3,000	150	3000
14	Miscellaneous lumber	Mft	10	10	15000	1,500	15000	1,500	30000	3,000	20000	2,000
15	Testing tanks	Each Tank	4	4	1,50000	6,000	1,50000	6,000	50000	2,000	100000	4000
16	Cleaning up	Lump Sum			100000	1,000	1,00000	1,000	10000	100	140000	1,400
	Sub totals for Alternative A Item 1 to 8 and 10 to 16 Inclusive					390,850				404,550		
	Sub totals for Alternative B Items 1 to 9 and 11 to 16, inclusive							397,300				410,250
17	Furnishing performance bond				1000	3908 50	1000	3,973	1500	6,068 25	1000	4102 50
	Totals					394,758 50		401,273 75		410,618 25		414352 50
	Bid Security — BB indicates Bid Bond, CC indicates Certified Check					BB 25,000.00				BB 24000.		BB 30,000

Item No	⑤ S Volpe & Co 150 Congress St Boston, Mass Alternative B Price	Amount	⑥ Coleman Bros Corp 40 Central St Boston Mass Alternative B Price	Amount	⑦ J A Singarella Co 15 Bay St Boston Mass Alternative A Price	Amount	⑧ John Bowen Co 129 Newbury St Boston Mass Alternative A Price	Amount
1	300	7500	150	3750	175	6,125	440	15400
2	300	7,500	100	2,500	125	4375	200	7,000
3	500	1000	500	1000	300	600	500	1,000
4	4800	81600	2000	34000	2125	46750	1900	41,800
5	4800	72,000	7000	105000	3925	125 600	4200	134400
6	5000	30000	7000	42,000	8500	51 000	3800	22800
7	325	21125	330	21450	320	32,000	320	32,000
8	0015	37,500	009	45000	007	105,000	0075	112,500
9	2874800	114,992	3200000	128,000	—	—	—	—
10	—	—	—	—	015	2400	015	2400
11	025	4250	025	4250	027	5,400	033	6600
12	0.34	17000	035	17500	037	18,500	063	31,500
13	150	3000	150	5000	150	3,000	143	2860
14	50000	5000	30000	3000	60000	6,000	38000	3800
15	125000	5000	50000	2000	1,25000	5,000	190000	7,600
16	200000	2,000	10000	100	1,00000	1,000	250000	2500
Sub totals for Alternative A						412,750		424.160
Sub totals for Alternative B		409467		412550				
17	1500	6142	15.00	6,188 25	1500	6191 25	1000	4,241 60
Totals		415609 00		418738 25		418941 25		428401 60
Bid Security		BB25 000				BB 22500		

Item No	⑨ Berke Moore Co Inc 8 Newbury St Boston Mass Alternative A Price	Amount	⑩ S Volpe & Co 150 Congress St Boston, Mass Alternative A Price	Amount	⑪ J A Singarella Co 15 Bay St Boston Mass Alternative B Price	Amount	⑫ V Bartlett Co 10 Whipple Ave Roslindale Mass Alternative A Price	Amount
1	500	17500	300	10500	175	4375	250	8,750
2	100	3500	300	10,500	125	3,125	100	3500
3	400	800	500	1,000	300	600	400	800
4	2500	55,000	3500	77,000	2375	40.375	4250	93,500
5	4000	128,000	3500	112,000	8000	120,000	4250	136,000
6	6000	36 000	5000	30,000	8500	51,000	4250	25500
7	350	35000	325	32500	320	20,800	300	30,000
8	007	105,000	0075	112 500	007	35,000	007	105,000
9	—	—	—	—	3000000	120,000	—	—
10	025	4,000	020	3200	—	—	015	2,400
11	040	8,000	025	5000	027	4590	020	4,000
12	045	22,500	034	17000	037	18,500	045	22,500
13	150	3000	150	3,000	150	3,000	175	3,500
14	20000	2000	50000	5,000	60000	6,000	20000	2,000
15	100000	4000	125000	5,000	1,25000	5,000	50000	2000
16	140000	1400	200000	2000	1,00000	1,000	200000	2000
Sub totals for Alternative A		425,700		426,200				441,450
Sub totals for Alternative B						433,365		
17	1000	4257	1500	6393 00	15 00	6500 47	1000	4414 50
Totals		429957 00		432,593 00		439865 47		445864 50
Bid Security								CC 25,000

Item No	⑬ John Bowen Co 129 Newbury St Boston Mass Alternative B Price	Amount	⑭ W N Worthington Co 159 Newport Ave Quincy Mass Alternative A Price	Amount	⑮ V Barletta Co 10 Whipple Ave Roslindale Mass Alternative B Price	Amount	⑯ Marcucci Bros Co 5 Ceylon St Dorchester Mass Alternative A Price	Amount
1	440	11,000	1000	35,000	250	6250	250	8750
2	200	5.000	250	8750	100	2500	300	0500
3	500	1.000	300	600	400	800	600	200
4	1900	32,300	3600	79200	5900	100,300	3500	77 000
5	8800	32000	3600	115 200	5900	88.500	4000	128,000
6	3800	22,800	3600	21,600	5900	35400	4000	24 000
7	320	20,800	310	31,000	300	19500	415	41 500
8	008	40,000	008	120,000	007	35,000	015	225 000
9	3162500	126 500	—	—	3200000	28 000	—	—
10	—	—	015	2400	—	—	100	16 000
11	033	5,610	021	4200	020	3400	035	7 000
12	063	31,500	038	19000	045	22500	040	20 000
13	143	2,860	125	2,500	175	3500	125	2500
14	38000	3800	30000	3000	20000	2000	40000	4000
15	190000	7600	1,00000	4000	50000	2000	500000	20000
16	250000	2500	100000	1000	200000	2000	500000	5,000
Sub totals for Alternative A				447,450				590,450
Sub totals for Alternative B		445,270				451,650		
17	1000	4452 70	1500	6711 75	1000	4516 50	1000	5904 50
Totals		449722 70		454161 75		456166 50		596354 50
Bid Security		BB 5%		BB 50,000				BB 5%

Notes
Alternative A is for conventional design
Alternative B is for prestressed design

★ Contract awarded May 6 1947
Contract executed May 26, 1947

Tabulated by JAC
Checked by

File Cont 146 - 5 22N-1

Acc 50 775

5118-108

ACME
BOOKBINDING CO., INC.

MAY 1991

1[illegible] CAMBRIDGE STREET
CHARLESTOWN, MASS